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WALTON AND HOLMES'S

ARITHMETICS

SECOND BOOK

BY

GEORGE A. WALTON, A.M.

AUTHOR OF FRANKLIN ARITHMETICS
FORMERLY AGENT OF MASSACHUSETTS STATE BOARD OF EDUCATION

AND

STANLEY H. HOLMES, A.M.

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PREFACE

THIS book, the second of the Walton and Holmes's series of Arithmetics, is designed for the fourth and fifth years in school. It is arranged in two parts to meet the demand of these two successive years. Each part reviews the subjects taught in previous years, and gives applications adapted to the pupils' intellectual development. The arrangement is strictly progressive. The method is illustrative, inductive, and topical, and the aim has been to limit the pursuit of each topic to the interest and capacity of the average pupil.

The nearest approach to completeness in the treatment of any topic is in the fundamental processes of expressing and combining integral numbers. The elementary combinations, in this as in the first book, are systematically arranged and so varied in their applications that they should give the pupil a reasonable mastery of all the combinations and a facility in the use of the more difficult equal to that in the easier. Accuracy and rapidity in the elementary combinations are of prime importance in all subsequent arithmetical work, and the interest of the child in the subject will be found to be in proportion to his *facility in their use.*

A device, original with the authors, by which the pupil makes his own tables and drills himself in multiplying

and dividing will prove to be both a relief to the teacher and of interest to the child. Other devices, especially the diagrams with exercises to teach the relations of numbers, will be of similar service.

Much care has been given to the practice of the four fundamental operations in written arithmetic, especially to Division, the most difficult of all.

An elementary study of Fractions, common and decimal, of Compound Denominate Numbers and Percentage, with a limited application to Simple Interest, is made in Part II of this book.

Exercises and problems, both oral and written, are abundant throughout the book. They will be found to be practical and sufficiently varied; no special attempt has been made to introduce those of a novel character. The oral work should be made prominent as in Book I.

The authors renew their thanks to the many teachers who have contributed suggestions and substantial material to the plan, the processes, and contents of the books of the series, in particular to Mr. Richard W. Nutter, Principal of Center Grammar School, Malden; Mr. Frank J. Peaslee, Superintendent of Schools, Lynn; and Miss A. J. Meadowcroft, Principal of Burnham School, Haverhill, Massachusetts. They are especially indebted to Miss Gertrude E. Bigelow of the Rice Training School, Boston, for a thoroughly critical review of the authors' manuscript, which has been the occasion for important additions and modifications to the book in many of its details.

G. A. W.
S. H. H.

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SECOND BOOK

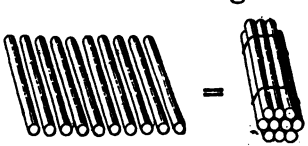
PART I

READING AND WRITING NUMBERS

Oral and Written Exercise

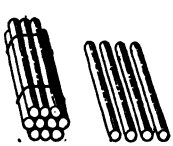
1. 1. Count from one to ten.

2. Write the figures from one to ten.



Ten ones make one ten.

We write 1 ten in figures as we write ten 1's, thus, 10.



Ten sticks and four more sticks make fourteen sticks, written in figures, thus, 14.

Ten and 5 more make fifteen, written thus, 15.

3. Ten and six make ——.

4. Count from ten to twenty.

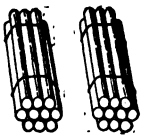
5. Read the following numbers:

11 12 14 13 16 15 17 19 18

6. Besides the 1 ten, how many ones are there in each of the numbers written above?

7. Write the figures that stand for the numbers from one to twenty.

Oral and Written Exercise



2. Ten and ten make twenty, written 20.
Three tens make thirty, written 30.
Four tens make forty, written 40.

1. Five tens make ——, written 50.

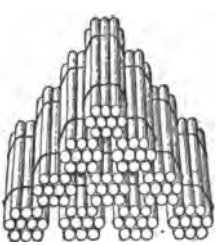
2. Six tens make ——. Seven tens make ——.

3. Eight tens make ——. Nine tens make ——.

4. How many tens are there in 20? 30? 40? 50? 60?

5. Read the following numbers and tell how many tens there are in each; how many ones in each besides the tens?

24 36 63 73 88 69 96 80 55 47

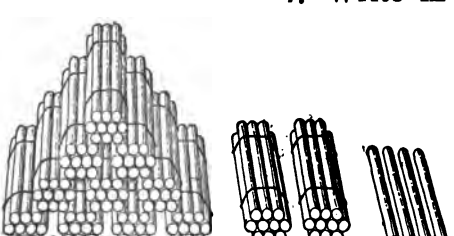


Ten 10's make one hundred, written thus, 100.

Two hundreds are written thus, 200. 3 hundreds thus, 300.

6. Read the following numbers: 100, 300, 200, 500, 600, 800.

7. Write in figures: one hundred; three hundred; seven hundred; nine hundred.



8. How many sticks are shown in this picture? We write the whole number shown here thus, 124. We read the number 124, thus, one hundred twenty-four.

Written Exercise

3. Read the following numbers:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
1.	384	86	481	400	989	100	325	384
2.	103	23	890	109	901	13	980	500

Write in figures the following numbers:

3. Seven hundred twenty-nine.

4. Five hundred fifty-six. 8. One hundred ninety-four.

5. Three hundred one. 9. Eight hundred sixteen.

6. Five hundred eighty. 10. Six hundred ten.

7. Six hundred seventeen. 11. Two hundred four.

12. In the number 342 which figure tells how many ones there are? Which tells how many hundreds?

13. In any three-figure number, the first figure on the right hand stands for what? The second figure stands for what? The third figure stands for what?

Ten hundreds equal one thousand.

We write one thousand thus, 1000.

Two thousand is written thus, 2000.

14. Read the following numbers: 1000, 3000, 5000, 8000.

15. Read the following numbers: 7, 18, 29, 30, 36, 99, 100, 260, 510, 1000, 2000, 6000.

16. In the number 6000, what does the 6 stand for?

17. In a four-figure number, the figure in the fourth place from the right stands for what?

Oral and Written Exercise

4. Read the following numbers:

	a	*b*	*c*	*d*	*e*	*f*
1.	1000	6483	1300	9803	5040	9801
2.	1542	1032	4805	1098	4500	1450

Write in figures, placing ones under ones, tens under tens, hundreds under hundreds, etc.

3. One thousand five hundred sixty-one.

4. Two thousand three hundred seven.

5. Four thousand one hundred forty-three.

We write ten thousands thus, 10,000; twenty thousands thus, 20,000, etc.

Write in figures the following:

6. 30 thousands 8. 25 thousands 10. 10 thousands

7. 11 thousands 9. 99 thousands 11. 60 thousands

12. In the number 30,000 what does the 3 stands for?

13. In a five-figure number a figure in the fifth place from the right stands for what?

Read:	*g*	*h*	*i*	*j*	*k*	*l*
14.	24,000	51,006	28,500	768	3155	80,900
15.	89,001	44,850	789	42,039	31,055	8090
16.	10,795	60,015	98,521	55,176	25,203	1001

We write one hundred-thousand in figures thus, 100,000; two hundred-thousands thus, 200,000, etc.

17. Write in figures 7 hundred thousand, 6 hundred 50.

Oral and Written Exercise

5. Illustrative Example. Read the number 253,476.

We might give a separate name for each figure; but in practice we separate the figures by a comma into groups, or periods, of three figures each, beginning at the right; and then read the number by periods thus: Two hundred fifty-three thousand, four hundred seventy-six.

hundred-thousands	ten-thousands	thousands	hundreds	tens	ones, or units
2	5	3,	4	7	6
Thousands,			ones (or units)		

Read the following:

1.	753,662	5.	14,432	9.	111,111	13.	106,072
2.	128,230	6.	530,175	10.	396	14.	50,800
3.	10,375	7.	208,907	11.	12,417	15.	590,070
4.	549,100	8.	500,609	12.	10,037	16.	340,680

Write in figures the following:

17. One hundred fifty-four thousand, six hundred forty-eight.

18. Four hundred twelve thousand, nine hundred twenty-seven.

19. One hundred ten thousand, six hundred twenty.

20. Four hundred three thousand, seven hundred nine.

21. One hundred sixty thousand, six hundred thirty.

22. Three hundred one thousand, thirty-two.

6. Letters are frequently used for numbering chapters, lessons, and exercises. This method of writing numbers is called the **Roman method.** The seven letters used are:

I = 1, V = 5, X = 10, L = 50, C = 100, D = 500, M = 1000.

7. By combining the above letters any number may be expressed, thus: X = 10, V = 5, XV = 10 and 5, = 15.

I = 1	XI = 11	XXI = 21
II = 2	XII = 12	XXII = 22
III = 3	XIII = 13	XXIII = 23
IV = 4	XIV = 14	XXIV = 24
V = 5	XV = 15	XXV = 25
VI = 6	XVI = 16	XXVI = 26
VII = 7	XVII = 17	XXVII = 27
VIII = 8	XVIII = 18	XXVIII = 28
IX = 9	XIX = 19	XXIX = 29
X = 10	XX = 20	XXX = 30

(1) Notice that V = 5, VI = 6, and VII = 7. When a letter is *followed* by a letter representing a value equal to, or less than its own value, the *sum* of the values of the two letters is expressed.

(2) Notice again that V = 5 and that IV = 4, also that X = 10, and IX = 9. When a letter is *preceded* by a letter of less value than itself, the *difference* of the values of the letters is expressed.

Written and Sight Exercise

8. 1. Write the letters that stand for 1, 5, 40, 90, 100.

Write the letters that stand for the numbers:

2. From 10 to 20
3. From 60 to 70
4. From 20 to 30
5. From 40 to 50
6. From 50 to 60
7. From 90 to 100

Read the following at sight:

	a	*b*	*c*	*d*	*e*	*f*
8.	X	XXI	XXXVIII	VIII	XLII	C
9.	XV	XXVI	XVIII	LX	XLVI	XCIV
10.	XVI	XXIX	XXXIX	XL	XLIX	XCIX

9. Illustrative Example I. Put together 32, 54, and 43.

WORK

32
54 } addends
43
129 sum

EXPLANATION. In doing the work, we write the numbers in columns, ones under ones, tens under tens, and draw a line beneath. We put together first the ones, then the tens; 3 and 4 and 2 are 9. We write 9 in the ones' place below the line. 4 tens and 5 tens and 3 tens are 12 tens. We write 12 at the left of the 9, and find that 32, 54 and 43 make 129. *Ans.* 129.

10. In practice we name, or think, only results; thus "3, 7, 9," and write 9; "4, 9, 12," and write 12. The last result, 129, is called the **sum.**

11. The process of uniting numbers to find their sum is **addition.** The numbers to be added are called **addends.**

12. The addition of 32, 54, and 43, may be expressed in columns as above, or thus, 32 + 54 + 43 = 129.

13. The sign + means *and* or *with*, and is called *plus*. The sign = means *equal* or *equals*.

Written Exercise

14. Copy and add upward; prove by adding downward:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*
1.	25	42	53	11	73	54	91	43	92	50
	43	74	92	46	65	83	67	92	22	76
	61	62	51	72	61	81	51	94	92	53
2.	93	52	64	95	84	60	92	91	82	42
	42	74	71	60	85	97	53	33	87	51
	83	71	42	73	50	32	93	94	30	85

Oral and Sight, and Written Exercise

15. 1. $30+1+2+1+2+1+2+1+2+1+2+1+2=?$

2. $23+3+3+3+3+3+3+3+3+3+3+3+3=?$

3. $28+3+4+3+4+3+4+3+4+3+4+3+4=?$

4. $35+4+5+4+5+4+5+4+5+4+5+4+5=?$

5. $47+2+3+2+3+2=?$

6. $25+4+4+4+4+4=?$

7. $29+5+6+5+6+5=?$

8. $33+6+6+6+6+6=?$

9. $21+7+7+7+7=?$

10. $15+7+8+7+8=?$

11. $43+8+8+8+8=?$

12. $16+8+9+8+9=?$

16. Illustrative Example II. Add 25, 67, and 44.

WORK

$$\begin{array}{r} 25 \\ 67 \\ 44 \\ \hline 136 \end{array}$$

EXPLANATION. We add the ones thus, 4, 11, 16 (ones); 16 (ones) = 1 ten and 6 ones. We write 6 in the ones' place of the sum and add the 1 ten with the tens. We add the tens thus, 1, 5, 11, 13 (tens). We write 13 at the left of the 6 and have for the entire sum 136. *Ans.* 136.

Copy and add upward; prove by adding downward:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
1.	66	65	97	78	48	74	58	89
	36	45	73	76	56	69	47	58
	27	75	75	34	86	21	85	69
	31	25	19	62	62	63	54	66
2.	36	45	47	97	37	67	74	75
	31	83	95	94	56	24	89	86
	49	8	77	89	80	99	57	56
	53	34	64	62	35	62	59	63

Written Exercise

17. Illustrative Example III. Add 268, 787, and 319.

Work
268
787
319
1374

EXPLANATION. We add the ones, thus, 9, 16, 24; 24 ones = 2 tens and 4 ones. We write 4 in the ones' place below the line, and add the 2 tens with the tens, thus, 2, 3, 11, 17; 17 tens = 1 hundred and 7 tens. We write 7 in the tens' place below the line and add the 1 hundred with the hundreds, thus, 1, 4, 11, 13. We write 13 at the left of the tens. *Ans.* 1374.

Copy, add, and prove:

	a	*b*	*c*	*d*	*e*	*f*	*g*
1.	777	534	626	995	945	249	438
	543	734	753	377	377	336	51
	789	968	865	483	674	235	725
	321	168	987	568	783	355	547
2.	862	998	889	697	898	963	84
	554	449	487	775	740	597	757
	734	756	557	956	948	577	255
	966	837	649	194	691	288	259
	475	264	629	475	926	566	186

Add the following by columns and by lines:

	3.	4.	5.		12.	13.	14.	15.
6.	274 +	132 +	972 =	16.	34 +	346 +	6079 +	8460 =
7.	106 +	618 +	980 =	17.	800 +	682 +	416 +	592 =
8.	87 +	7 +	607 =	18.	147 +	64 +	346 +	1848 =
9.	428 +	53 +	89 =	19.	675 +	798 +	5164 +	9087 =
10.	536 +	964 +	563 =	20.	398 +	499 +	9075 +	708 =
11.	+	+	=	21.	+	+	+	=

18. The **cent** is the smallest piece of money that we use. It is made of bronze. 100 cents are equal to 1 dollar.

The **nickel** is a 5-cent piece. It is made of nickel. 20 nickels are equal to 1 dollar.

The **dime** is a 10-cent piece. It is made of silver. 10 dimes are equal to 1 dollar.

The **quarter dollar** is a 25-cent piece. It is made of silver. 4 quarter dollars are equal to 1 dollar.

The **half dollar** is a 50-cent piece. It is made of silver. 2 half dollars are equal to 1 dollar.

The **dollar** is equal to 100 cents. There are both gold and silver dollars; also a paper dollar called a *bank note* made to represent the value of a gold or a silver dollar.

We use the sign $ for dollars, and ¢ or ct. for cents.

NOTE. The teacher should have samples of money of each of the above denominations in the class-room; the pupil should observe and handle them. Toy money will serve for continuous use.

Oral Exercise

19. Read and fill out:

1. Two dimes equal —— cents; 3 nickels equal —— cents.

2. One dollar equals —— cents; 5 dollars equal —— cents.

3. One half dollar equals —— cents; $1 and a half dollar equal —— cents.

4. One quarter dollar equals —— cents; $3 and a quarter equal —— cents.

5. What four pieces of money equal ninety cents?

6. I have 2 half dollars. If you have 3 quarters, 2 dimes, and 2 nickels, how much more have you?

7. Count the change from 2 quarters to pay 32 cents; from $1 to pay 40¢; from a quarter to pay 9¢.

Written Exercise

20. Illustrative Example. Write $28 and 32¢ together.

EXPLANATION. We write $28 and 32¢ together thus, $28.32. Thirty-two cents may be written $0.32 or $.32.

21. The dot which separates the figures for cents from the figures for dollars is called the **decimal point**.

Using the decimal point and dollar sign write:

	a	*b*	*c*
1.	2 dollars and 48¢	14 dollars and 36¢	20 dollars and 10¢
2.	7 dollars and 50¢	10 dollars and 60¢	4 dollars and 9¢
3.	40 dollars and 8¢	0 dollars and 75¢	0 dollars and 8¢

4. Read: $9.37; $5.43; $6.18; $7.40; $0.08; $.80.

Written Exercise

22. Illustrative Example. What is the sum of \$48.19, \$0.97, and \$5.08?

Work
\$ 48.19
0.97
5.08
\$ 54.24

EXPLANATION. We write the given numbers with the decimal points in a vertical column. We add as we add other numbers, remembering to separate the dollars and cents of the sum by the decimal point. *Ans.* \$ 54.24.

Copy, add, and prove:

1.	2.	3.	4.
\$ 72.45	\$ 9.88	\$ 77.68	\$ 92.87
7.75	60.53	94.67	99.27
9.06	48.96	5.52	8.93
40.73	51.76	33.66	78.89
17.35	65.18	31.14	26.42
64.87	5.23	73.59	34.34

5. 89¢ + 74¢ + 64¢ + 23¢ + 58¢ + 63¢ + 59¢ + 89¢ + 42¢ = ?

6. A merchant's sales for Monday were \$ 450.49, for Tuesday \$ 321, for Wednesday, \$ 368.86. The total sales were ——.

7. In repairing a house the following sums were paid: for carpenter's work \$ 910, for outside painting \$ 175.80, for papering and painting inside \$ 342.96, for plumbing \$ 520.75, for new heating apparatus \$ 615. What was the total expense?

8. A week's receipts for an electric car were as follows: Monday \$ 18.60, Tuesday \$ 16.50, Wednesday \$ 21.30, Thursday \$ 19.20, Friday \$ 22.00, Saturday \$ 24.75, Sunday \$ 44.25. The total receipts were ——.

Written Exercise

23. The cost of material for four buildings was as follows. Find the cost for each building and for each item for the four buildings:

		1.	2.	3.	4.
5.	Floors,	$29.00	$67.00	$85.50	$68.85
6.	Sheathing,	25.00	43.80	70.80	53.95
7.	Bricks and mortar,	16.80	37.63	48.75	37.38
8.	Paint and glazing,	24.45	53.50	63.00	44.48

9. How many square miles are there in the New England states, Maine having 33,040 square miles, New Hampshire 9,341, Vermont 9,564, Massachusetts 8,266, Rhode Island 1,248, and Connecticut 4,965?

Add the following in columns and in lines:

	10.		11.		12.		13.	
14.	363	+	247	+	1036	+	46	=
15.	407	+	621	+	908	+	900	=
16.	98	+	72	+	1684	+	267	=
17.	536	+	63	+	99	+	768	=
18.	647	+	975	+	423	+	419	=
19.		+		+		+		=

	20.		21.		22.		23.	
24.	$15.78	+	$50.64	+	$4.63	+	$579.80	=
25.	4.63	+	2.22	+	80.67	+	66.67	=
26.	50.38	+	18.05	+	99.10	+	112.13	=
27.	0.27	+	44.65	+	70.00	+	9.97	=
28.	20.34	+	49.17	+	83.83	+	745.82	=
29.		+		+		+		=

24. Illustrative Example I. There are 52 weeks in a whole year. If there are 32 weeks in a school year, how many weeks remain for vacation?

Work	
52	minuend
32	subtrahend
20	remainder

EXPLANATION. To find how many weeks remain we take 32 weeks out of 52. 2 ones from 2 ones leaves nothing. We write 0 in the ones' place below the line. 3 tens from 5 tens leaves 2 tens. We write 2 in the tens' place below the line. 20 weeks remain. *Ans.* 20 weeks.

25. The process of taking part of a number away to find what number is left is called **subtraction.**

26. The number to be taken away is called the **subtrahend.**

27. The number from which the subtrahend is to be taken away is called the **minuend.**

28. The part left is called the **remainder** or **difference.**

29. The subtraction of 32 from 52 is expressed thus, $52 - 32 = 20$, read thus, 52 less 32 equals 20, or 52 minus $32 = 20$.

30. The sign $-$, called **minus**, means less.

31. PROOF. If we add 20 and 32, what should their sum be? How then can we prove the work in subtraction?

Written Exercise

32. Subtract, and prove by adding the remainder and subtrahend.

1.	2.	3.	4.	5.
481	864	376	657	992
311	432	114	543	762

Written Exercise

33. 1. There are 365 days in a common year. 313 are working days. How many are Sundays?

2. How much of a debt of $557 remains after $324 is paid?

3. By rail New York and Chicago are 998 miles apart. By air line they are 750 miles apart. How much greater is the distance by rail?

4. The distance by rail from Troy to Boston is 191 miles. By air line the distance is 150 miles. How much less is the distance by air line than by rail?

5. Of a lot of 688 barrels of apples, 123 barrels were frozen. How many barrels were left?

Oral and Sight Exercise

34. 1. $81-2-8-3-7-4-6-5-5-6-4-7=?$

2. $82-3-7-4-6-5-5-6-4-7-3-8-2=?$

3. $83-4-6-5-5-6-4-7-3-8-2-9-1=?$

4. $84-5-5-6-4-7-3-8-2-9-1-5-5=?$

5. $85-6-4-7-3-8-2-9-1-6-4-7-3=?$

6. $86-7-3-8-2-9-1-7-3-8-2-9-1=?$

7. $87-8-2-9-1-8-2-9-1-8-2-9-1=?$

8. $88-9-1-5-5-6-4-7-3-8-2-9-7=?$

9. $89-5-5-6-4-7-3-8-2-9-1-5-5=?$

10. $81-1-8-2-7-3-6-4-5-5-4-6-3=?$

11. $99-10-11-10-11-10-11-10-11-10=?$

12. $95-11-10-11-10-11-10-11-10=?$

Written Exercise

35. Ill. Ex. II. What remains of \$875 after \$349 are spent?

WORK

$$\begin{array}{r} \$\,875 \\ 349 \\ \hline \$\,526 \end{array}$$

EXPLANATION. To find what remains we subtract 349 from 875. We cannot take 9 ones out of 5 ones, so we think of one of the 7 tens as united with the 5 ones, making 15 ones. 9 ones from 15 ones leaves 6 ones. We write 6 in the ones' place below the line. 4 tens from the remaining 6 tens leaves 2 tens. We write 2 in the tens' place below the line.

3 hundreds from 8 hundreds leaves 5 hundreds. We write 5 in the hundreds' place below the line and have for the remainder \$ 526. *Ans.* \$ 526.

36. In practice we may think 9 from 15 = 6, and write 6; 4 from 6 = 2, and write 2; 3 from 8 = 5, and write 5. Or, we may think 9 and **6** are 15, and write 6; 4 and **2** are 6, and write 2; 3 and **5** are 8, and write 5. *Ans.* \$ 526.

Copy, subtract, and prove:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
1.	91	72	56	583	968	142	855	946
	48	35	18	254	239	117	464	272
2.	83	93	34	574	684	764	946	658
	68	49	15	326	437	518	292	273
3.	85	75	85	766	486	896	734	864
	28	29	46	437	158	839	452	693
4.	94	76	95	750	420	870	460	706
	47	39	67	327	213	465	257	582

Written Exercise

37. Illustrative Example III. What remains of 2425 after 1546 is subtracted?

WORK

2425
1546
879

EXPLANATION. As in Illustrative Example II, we think of one of the two tens as united with the 5 ones, making 15; 6 from 15 leaves 9. We write 9 in the ones' place below the line. Since we cannot take 4 (tens) from the 1 (ten) which remains, we think of one of the 4 hundreds as united with the tens, making 11 tens. 4 from 11 leaves 7. We write 7 in the tens' place below the line. Since we cannot take 5 hundreds from 3 hundreds which remain, we think of 1 of the 2 thousands as united with the 3 hundreds, making 13 hundreds. 5 from 13 leaves 8, which we write in the hundreds' place below the line. 1 thousand from 1 thousand which remains leaves nothing. We write nothing in the thousands' place. *Ans.* 879.

Copy, subtract, and prove:

	a	*b*	*c*	*d*	*e*	*f*	*g*
1.	831	761	991	1181	1181	1252	1192
	312	629	635	773	348	436	668
2.	1232	1282	1052	1383	6363	4373	5354
	715	279	343	954	537	2726	3829
3.	6175	8164	7596	9074	3295	9675	5466
	4526	5426	3837	4558	2849	8967	4559

For subtracting by addition, see explanation of Illustrative Example II, page 22, Art. 36.

Written Exercise

38. Illustrative Example IV. What remains of $4.05 after $2.46 is subtracted?

WORK

(3) (9) (15)

$4. 0 5

2. 4 6

$1. 5 9

EXPLANATION. We subtract dollars and cents as we subtract other numbers.

As there are no tens of cents in $4.05 we think of 1 of the $4 as changed to 10's of cents and of 1 of the 10's (9 being left) as united with the 5 cents. $4.05 is thus thought of as changed to $3, 9 tens, and 15 ones of cents, from which if we take $2, 4 tens, and 6 ones of cents, we shall have left $1.59. *Ans.* $1.59.

Copy, subtract, and prove:

	a	*b*	*c*	*d*	*e*	*f*
1.	306	207	504	600	200	1409
	159	89	127	403	88	993
2.	$7.04	$14.04	$40.64	$20.68	$24.09	$20.69
	3.39	8.37	7.92	12.73	12.79	16.73
3.	$40.82	$80.91	$25.02	$40.82	$32.05	$4.00
	34.15	25.44	12.59	34.15	17.54	2.85

4. If you have $10.95 and spend $6.87 for a coat, how much money do you have left?

5. Amy had in the bank $80.40 July 1st, and after drawing out a part of it, she still had $73.68 left. How much did she draw out?

6. Find the difference between $86.42 and $90.16.

Written Exercise

39. 1. Write in figures sixty thousand nine hundred.

2. Write in Roman numerals 19; 36; 98.

3. A man owns three pieces of timber land; one contains 625 acres, another 842 acres, and the third 767 acres. How many acres are there in the three pieces?

4. 6 bales of jute weighed respectively 536 pounds, 519 pounds, 107 pounds, 498 pounds, 486 pounds, and 467 pounds. What was the total weight?

5. From Buffalo to New York by way of Albany is 410 miles. To Albany it is 297 miles. How far apart are New York and Albany?

6. My mileage book originally contained 1000 miles. I have used 325 miles. How many miles will be left if I ride upon it from Albany to Buffalo?

7. A man paid for an automobile $874. He sold it at a loss of $189. For how much did he sell it?

8. What is the total weight of 5 lots of sole leather weighing as follows: 563 pounds, 695 pounds, 705 pounds, 894 pounds, and 684 pounds?

9. Grace has $2.64, Jane has $8.29. How much have both together? How much less has Grace than Jane?

Copy, subtract, and prove:

	a	*b*	*c*	*d*	*e*	*f*
10.	$1.00	$2.00	$2.65	$7.79	$10.64	$20.68
	.19	.40	.85	5.88	7.92	12.73
11.	$14.94	$14.74	$18.58	$19.57	$12.79	$90.06
	6.15	8.37	4.64	6.75	2.95	78.22

40. Illustrative Example. There are 3 feet in one yard. How many feet are there in 4 yards?

ADDED	MULTIPLIED
3	3 multiplicand
3	4 multiplier
3	12 product
3	
12 sum	

EXPLANATION. We may add thus, $3 + 3 + 3 + 3 = 12$; or, we may find the result in a shorter way, by uniting the 3's at once; thus, four 3's are 12. *Ans.* 12 feet.

41. The number found by uniting equal numbers at once is called the **product.**

42. The process of uniting a number of equal numbers to find their product is called **multiplication.**

43. One of the equal numbers, or the number to be multiplied, is called the **multiplicand.**

44. The number to multiply by is called the **multiplier.**

45. The multiplication of 3 feet by 4 may be expressed as above, or in either of these two ways, 3 feet × 4, read 3 feet multiplied by 4; or 4 × 3 feet, read 4 times 3 feet. 3 × 4 is read 3 times 4 or 3 multiplied by 4.

46. The sign × means **times,** or **multiplied by.**

Oral Exercise

47. 1. How many are two 5's? three 5's? four 5's?

2. Read and give the product of 4 × 2 pencils; of 3 × $4; of 2 pencils × 4; of $4 × 3.

3. Read and give the products: 3 × 2; 4 × 3; 5 × 2.

48. To make Multiplication Tables. For convenience in future work we must make and learn lists of the products obtained by multiplying all numbers from 1 to 12 by every number from 1 to 12. Such lists are called **multiplication tables.**

Illustrative and Oral Exercise

49. 1. Add by 2's from 2 to 24. Two 2's are ——; three 2's are ——.

TABLE OF 2'S

1	2	2
2	2	4
3	2	6
4	2	
5	2	
6	2	
7	2	
8	2	
9	2	
10	2	
11	2	22
12	2	24

2. Write in a column twelve 2's and draw a vertical line on each side of the column.

3. Beginning at the top, write at the left and against the 2's the numbers from 1 to 12.

4. Against the 2's and in line with the numbers from 1 to 12, write the products of 2 multiplied by 1, by 2, by 3, etc., completing the products as begun.

5. Repeat the table forward and backward thus: one 2 is 2, two 2's are 4, or once 2 is 2, 2 times 2 are 4, and so on.

6. Repeat the table, using 2 as the multiplier, thus: two 1's are 2, two 2's are 4, two 3's are 6, and so on.

7. Compare the products of three 2's and two 3's; 5×2 and 2×5.

8. Multiply 2 as rapidly as possible by each of the following numbers: 3, 5, 2, 1, 4, 6, 10, 11, 12, 8, 9, 7.

9. Beginning at the left, multiply each number in example 8 by 2. Beginning at the right, multiply each number by 2 and add 1 to each product.

50. Illustrative Examples. Multiply (1) 56 by 2; (2) $1.78 by 2.

WORK

(1) 56
×2
112

EXPLANATION. For convenience we write the multiplier under the multiplicand and draw a line beneath.

(1) To multiply 56 by 2 we think 2 times 6 ones = 12 ones; 12 ones = 1 ten and 2 ones. We write 2 below the line in the ones' place and reserve the 1 ten. 2 × 5 tens = 10 tens. 10 tens with the 1 ten reserved makes 11 tens. We write the 11 tens at the left of the 2 and have for the product 112. *Ans.* 112.

(2) We multiply dollars and cents as we multiply other numbers. Thus, 2 × 8 cents = 16 cents. We write 6 in the cents' place and reserve the 1 ten. 2 × 7 tens = 14 tens; 14 tens with the 1 ten reserved = 15 tens; 15 tens = 1 hundred cents (or $1), and 5 tens of cents. We write 5 in the tens' place and reserve the $1. 2 × $1 = $2; $2 with the $1 reserved = $3. We write 3 in the dollars' place and have for the product $3.56. *Ans.* $3.56.

WORK

(2) $1.78
×2
$3.56

In multiplying dollars and cents remember to put the decimal point between dollars and cents in the product.

Written Exercise

51.

1. 36 boys × 2.
2. 48 trees × 2.
3. 75¢ × 2.
4. $47 × 2.
5. $1.75 × 2.
6. $2.19 × 2.
7. $4.70 × 2.
8. $6.34 × 2.
9. $7.86 × 2.

Oral Exercise

52. 1. Stella found 2 robins' nests with 4 eggs in each. How many eggs were there in both?

SOLUTION. There were 4 eggs in 1 nest; in 2 nests there were 2 times 4 eggs. 2 times 4 are 8. There were 8 eggs.

2. At the rate of 10 marbles for 1 cent, how many can be bought for 2 cents?

3. A house fly has 6 legs. How many legs have 2 flies?

4. Susan is 11 years old. Her mother is twice as old as she. How old is her mother?

Written Exercise

53. 1. How much money do I need to buy 2 knives at 25 cents apiece?

2. I buy 2 pounds of tea at 48 cents a pound. How much does it cost?

3. John has 37 marbles; Clifford has twice as many. How many has Clifford?

4. 12 oranges are worth —— times as much as 6 oranges. If 6 oranges are worth 18 cents, 12 are worth —— cents.

5. A common striking clock makes 78 strokes in a half day of 12 hours. How many strokes does it make in a whole day of 24 hours?

6. Julia goes 2 feet at a step. The lawn is 47 steps wide. How many feet is it across the lawn?

Oral Exercise

54. _____ This is a 1-inch line.

1. By counting find the number of inches on a foot ruler.

2. Apply the foot ruler to a yardstick and tell how many feet equal 1 yard.

3. 1 foot contains how many lengths of 6 inches? of 2 inches? 4 inches? 3 inches?

4. In 24 inches there are how many 12-inch spaces? How many feet are there?

5. Cut a piece of paper 1 inch wide and 1 foot long. Put the ends together and crease it so that it will be divided into two equal parts. How many inches are there in one of these parts? We call one of these parts 1 half.

If we divide the paper into three equal parts, we call one of the parts 1 third. If we divide it into 4 equal parts, we call one of the parts 1 fourth.

55. **One of the 2 equal parts of a thing or a number is *1 half* of it; one of the 3 equal parts is *1 third* of it; one of the 4 equal parts is *1 fourth* of it.**

We write 1 half, $\frac{1}{2}$; 1 third, $\frac{1}{3}$; 1 fourth, $\frac{1}{4}$.

6. How many inches in $\frac{1}{2}$ ft.? in $\frac{1}{4}$ ft.? in $\frac{1}{3}$ ft.?

7. Measure in the schoolroom or school yard a distance of $5\frac{1}{2}$ yards. This distance is 1 **rod.**

56.

LINEAR MEASURE

12 inches equal 1 foot.
3 feet equal 1 yard.
$5\frac{1}{2}$ yards equal 1 rod.

We write **in.** for inches, **ft.** for feet, **yd.** for yards, **rd.** for rods.

Oral Exercise

57. 1. Count these marks by 1's; by 2's; and tell how many 1's there are; how many 2's.

2. Tell how many 2's there are in each of the following numbers. Try to do both series equally fast.

a. 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24.
b. 4, 2, 8, 6, 10, 14, 20, 24, 16, 12, 18, 22.

58. Illustrative Example. How many times is 2 contained in 48?

WORK

$$\begin{array}{r} 24 \text{ quotient} \\ \text{Divisor } 2\overline{)48} \text{ dividend} \end{array}$$

EXPLANATION. 48 = 4 tens and 8 ones. 2 is contained in 4 tens 2 tens times. We write 2 above the line in the tens' place. 2 is contained in 8 ones 4 times. We write 4 above the line in the ones' place. 2 tens with 4 ones = 24. *Ans.* 24 times.

59. The process of finding how many times one number is contained in another is called **division.**

60. The number to be divided is called the **dividend.**

61. The number to divide by is called the **divisor.**

62. The result of the division is called the **quotient.**

63. Division may also be expressed as follows:

$48 \div 2 = 24$, read 48 divided by 2 = 24.

$\frac{48}{2} = 24$, read 48 divided by 2 = 24, or 1 half of 48 = 24.

64. The sign $\div$ means **divided by.**

Written Exercise

65.

	a	*b*	*c*	*d*	*e*	*f*
1.	$2\overline{)26}$	$2\overline{)42}$	$2\overline{)64}$	$2\overline{)80}$	$2\overline{)66}$	$2\overline{)88}$
2.	$28 \div 2$	$46 \div 2$	$62 \div 2$	$84 \div 2$	$40 \div 2$	$36 \div 2$

66. Illustrative Ex. (1) Divide 56 by 2; (2) 149 by 2.

(1) WORK

$$2\overline{)56}\quad 28$$

EXPLANATION. (1) 2 is contained in 5 tens 2 tens times and 1 ten over. We write 2 in the tens' place above the line in the quotient. The 1 ten left over with the 6 ones = 16 ones. 2 is contained in 16, 8 times. We write 8 in the ones' place above the line. 2 tens with 8 ones = 28. *Ans.* 28.

(2) WORK

$$2\overline{)149-1}\quad 74$$

(2) As 1 hundred divided by 2 gives no hundreds, we first divide 14 tens. 2 is contained in 14 tens 7 tens times. We write 7 in the tens' place in the quotient. 2 is contained in 9, 4 times and 1 over. We write 4 in the ones' place in the quotient and the 1 left over with the minus sign at the right of the dividend. *Ans.* 74, *remainder* 1.

67. In dividing, the number left over is called the **remainder**.

68. PROOF. To prove (1) multiply 28 by 2; the product should be 56. To prove (2) multiply 74 by 2 and add 1 to the product; the result should be 149.

Copy, divide, and prove:

	g	*h*	*i*	*j*	*k*	*l*
3.	$2\overline{)38}$	$2\overline{)56}$	$2\overline{)72}$	$2\overline{)96}$	$2\overline{)70}$	$2\overline{)92}$
4.	$2\overline{)125}$	$2\overline{)167}$	$2\overline{)149}$	$2\overline{)113}$	$2\overline{)131}$	$2\overline{)178}$

Written Exercise

69. Illus. Ex. Divide 96 cents equally between 2 boys.

WORK

$$2\overline{)96}\quad 48$$

EXPLANATION. Each boy will get $\frac{1}{2}$ of 96 cents. To find $\frac{1}{2}$ of a number we divide it by 2. There will be as many ones in each part as there are 2's in the whole number. 2 is contained in 96, 48 times.

Ans. Each boy will receive 48 cents.

1. 52 pencils were distributed equally between 2 classes. How many pencils was this to a class?

2. There are 34 plates in two equal sets. How many are there in each set?

3. A string 170 feet long was cut into halves. $\frac{1}{2}$ of the string was how many feet long?

4. If 2 hammers cost \$ 1.50, what is the cost of 1?

5. If a chain 250 feet long is cut in halves, 1 half of it is how long?

6. 76 children are marching in 2 equal lines. How many are there in each line?

7. 176 oranges in 2 baskets will allow how many to each?

8. There are 248 pages in a book. How many pages are there in one half of the book?

9. Find $\frac{1}{2}$ of the sum of 40 and 66; of 84 and 10.

Divide and add as in example 10:

10.	11.	12.	13.
$144 \div 2 = 72$	$58 \div 2 =$	$106 \div 2 =$	$308 \div 2 =$
$46 \div 2 = 23$	$76 \div 2=$	$38 \div 2 =$	$978 \div 2 =$
$190 \div 2 = 95$	$\div 2 =$	$\div 2 =$	$\div 2 =$

70. Illustrative Example. Two neighbors share equally in building a partition fence 183 feet long. How many feet does each build?

WORK

$$2\overline{)183}\quad 91\tfrac{1}{2}$$

EXPLANATION. Each builds $\frac{1}{2}$ of 183 feet. $\frac{1}{2}$ of 183 feet is 91 feet with 1 foot undivided. $\frac{1}{2}$ of 1 foot $= \frac{1}{2}$ foot.

Ans. Each builds $91\frac{1}{2}$ feet.

Written Exercise

71. 1. How long will 1 ton of coal last if 2 tons are burned in a range in 133 days?

2. In 239 pints of cream there are how many quarts?

3. Uncle William divides $345 equally between his nephew and niece. How much does each receive?

4. A hogshead holds 63 gallons. If 2 barrels hold as much as 1 hogshead, how much does 1 barrel hold?

5. A car load of oranges of 356 boxes was shared equally by 2 fruit dealers. What was the share of each?

6. A bunch of 36 pinks was divided equally between 2 sisters. How many pinks did each get?

7. 56 bags of salt were divided equally between 2 men. How many bags did each get?

8. The board of a family of 6 for a week was $37. How much would the board be for a family 1 half as large?

9. How many days will it take 2 men to do as much work as 1 man can do in 67 days?

10. How long ought it to take 2 boys to shovel a snow path which 1 boy can shovel in 25 minutes?

Oral and Written Exercises

72. 1. Count by 10's from 10 to 120, and back.

2. Make a multiplication table of 10's as you made the table of 2's, page 27.

3. Repeat the table rapidly forward and back.

4. Cover the products and repeat.

5. Give rapidly the products of 10 multiplied by
4 3 5 1 2 8 10 9 6 7 11 12.

6. Multiply the above by 10 and write the products.

7. Repeat, going in the opposite direction, and adding to each product numbers from 1 to 9 as the teacher directs.

Give the quotients and remainders of the following divided by 10:

8. 30 100 50 40 80 70 60 90 20 10 110 120

9. 37 106 53 46 85 72 68 94 29 15 117 127

10. How many cents are there in 2 dimes? dimes in $2?

11. At 10¢ each, what is the cost of 3 balls?

12. How many gallons are there in 5 casks holding 10 gallons each?

13. How many trees are there in an orchard that has 10 rows of 10 trees each? 12 rows of 10 trees each?

14. I ride 10 miles each day for a week. How many miles do I ride in a week? in a week and 4 days?

15. James is 10 years old. His uncle is 6 times as old as he, and 3 years more. How old is his uncle?

16. What is the cost of 2 oranges if 10 cost 50¢? What is the cost of 10 if 2 cost 12¢?

Oral and Written Exercise

73. 1. Count on by 10's to 60; by 5's to 60; count back from 60 to 0 by 10's and by 5's.

2. Make a multiplication table of 5's as you made the table of 2's, page 27. Repeat the table of 5's till the products come instantly to mind. Repeat the table, using 5 as the multiplier; thus, 5 times 1 are 5, etc.

3. Multiply 5 as rapidly as possible by each of the following: 10, 2, 5, 4, 8, 1, 3, 6, 9, 7, 11, 12.

4. Multiply the above by 5, and add to each product 1, 2, 3, or 4 as the teacher directs. Give only results.

Divide each of the following by 5; divide each by 10:

5. 10 25 15 30 20 45 35 50 60 40 55

6. 14 28 19 32 23 47 36 54 63 42 56

7. How many houses are there in 3 blocks of 5 houses each?

8. What is the weight of 11 fowls, each weighing 5 pounds?

9. How many 5-cent pieces are there in 54 cents?

10. Eight 5-ounce bottles will hold how many ounces?

11. 1 dozen is 12. 5 dozen = ——.

Written Exercise

	a	*b*	*c*	*d*	*e*	*f*
74. 1.	24	13¢	78¢	62¢	$9.34	$5.86
	× 5	× 5	× 5	× 5	× 5	× 5
2.	63 × 5	87 × 5	91 × 5	142 × 5	$.74 × 5	$.50 × 5

Oral Exercise

75. 1. There are —— cents in 1 dime, and —— dimes in 1 dollar. Then 1 cent is 1 **tenth** of a dime, and 1 dime is 1 —— of \$1. We write 1 tenth in figures thus, $\frac{1}{10}$.

2. If 1 cent is $\frac{1}{10}$ of a dime, how many tenths of a dime are 3 cents? 5 cents? 8 cents?

3. 2 dimes = —— cents. $\frac{1}{10}$ of 2 dimes = —— cents. 2 cents equal what part of 2 dimes?

4. 2 cents equal how many tenths of 1 dime? 3 cents equal how many tenths of 1 dime?

5. A horse travels 10 miles in 90 minutes. In how many minutes can he travel 5 miles?

6. At 80 cents for 10 cakes of soap, what is the cost of 1 cake?

What is the cost of 1,

7. If 10 tons of coal cost \$70?
8. If 10 sheep cost \$40?
9. If 10 sodas cost 50 cents?

How many

10. Dimes in 60 cents?
11. Dollars in 70 dimes?
12. Dimes in 120 cents?

13. There are —— cents in 1 nickel. 1 cent is 1 fifth of 1 nickel. We write 1 fifth in figures thus, $\frac{1}{5}$.

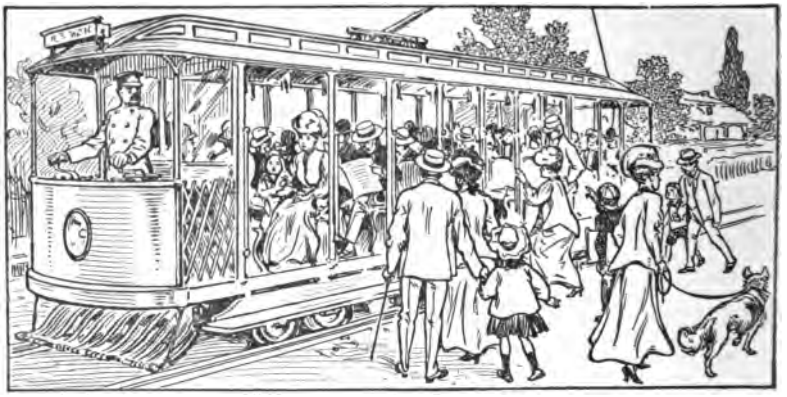
14. $\frac{1}{5}$ of 1 dime = —— cents. $\frac{2}{5}$ of a dime = —— cents.

15. What is $\frac{1}{5}$ of 25 cents? of 30 cents? of \$40? of \$50?

Written Exercise

76. Copy, divide, and prove by multiplying:

1.	2.	3.	4.	5.	6.	7.
$5\overline{)75}$	$5\overline{)62}$	$5\overline{)105}$	$5\overline{)160}$	$5\overline{)65}$	$5\overline{)81}$	$5\overline{)857}$



Oral Exercise

77. 1. If a single car fare is 5 cents, how much are 3 fares? 4 fares? 9 fares?

2. A man rides to business in the morning, home and back to business at noon, and home again at night on 5-cent fares. How much do they cost a day?

3. If children get 2 car tickets for 5 cents, how much do 10 such tickets cost?

4. 3 dimes and 5¢ will pay for how many 5-cent fares?

Written Exercise

78. 1. Write in figures XLVII, LIX, LXXIV, and DXC.

2. A man's wages are \$18 a week. If his expenses are \$9.58, how much can he save in a week?

WORK

\$18.00
9.58
\$8.42

3. At \$12.50 a week, how much can a man earn in 2 weeks? in 5 weeks? in 10 weeks?

Oral Exercise

79. 1. Count by 2's to 24; by 4's to 48. Count back from 48 to 0 by 2's and by 4's.

2. Make a multiplication table of 4's as you made the table of 2's, page 27.

3. Repeat the table of 4's as you did the table of 2's.

4. Repeat forward and back, using 4 as the multiplier.

5. Multiply each of the following by 4:

2 4 8 5 10 12 11 9 1 3 6 9 7

6. Multiply again, going in the opposite direction, and add to the product 1, 2, or 3. Give only final results.

Divide each of the following by 4:

7. 8 16 12 20 4 40 32 24 36 44 28 48

8. 11 18 15 23 6 41 35 25 38 46 31 51

9. 4 quarters make a dollar. How many quarters are there in 2 dollars? in 3 dollars? in 7 dollars?

10. 4 weeks make a school month. How many weeks are there in 6 school months?

11. How many shoes are needed to shoe 9 horses?

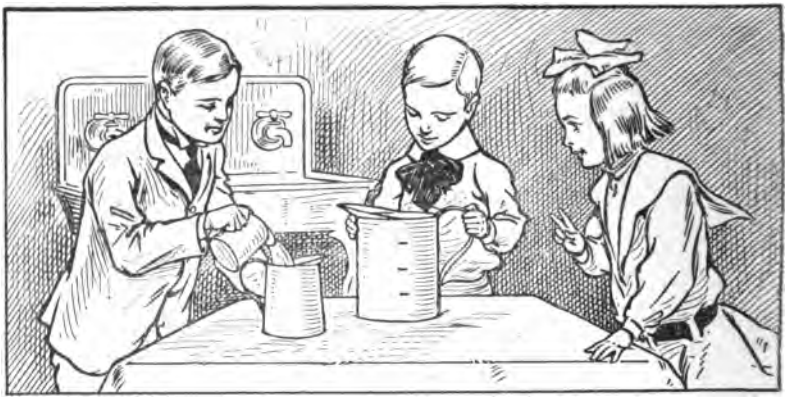
Written Exercise

80. Find the cost of:

1. 4 balls at 25¢ each.
2. 4 tickets at 50¢ each.
3. 4 books at 99¢ each.
4. 4 books at $0.17 each.

Multiply:

	a	*b*	*c*	*d*	*e*	*f*
5.	421	348	590	765	487	579
	×4	×4	×4	×4	×4	×4



Measuring and Oral Exercise

81. 1. Fill the pint measure with water and pour out into the quart measure. Do this again. How many pints make 1 quart?

2. Fill the quart measure and empty it into the gallon measure till the gallon measure is full. How many quarts make 1 gallon?

3. In a pint there are 4 gills. How many gills are there in 1 quart?

4. Repeat the table of liquid measure:

82.

LIQUID MEASURE
4 gills = 1 pint.
2 pints = 1 quart.
4 quarts = 1 gallon.

We write **gi.** for gills, **pt.** for pints, **qt.** for quarts, and **gal.** for gallons.

5. How many pints make 1 quart? 2 quarts? 1 gallon?

6. One pint is equal to what part of a quart?

Oral Exercise

83. 1. Count by 4's to 48. Count by 8's to 96.

2. Make a multiplication table of 8's as you made the table of 2's on page 27.

3. Repeat the table of 8's as you did the table of 2's.

4. Repeat forward and back, using 8 as the multiplier.

5. Multiply the following numbers by 8 as rapidly as possible: 2, 4, 8, 5, 10, 3, 6, 9, 7, 11, 12, 1.

6. Multiply the above by 8 and add to the products 1, 2, 3, or 4 as the teacher directs. Give only results.

Divide each of the following by 8:

7. 16 32 24 48 64 56 8 80 72 96 88

8. 18 35 28 51 70 57 15 86 77 100 93

9. If I get 8 eggs a day, how many shall I get in 2 days?

10. If I get 2 eggs a day, how many shall I get in 8 days?

11. How many gills are there in 1 quart? in 3 quarts? in 5 quarts?

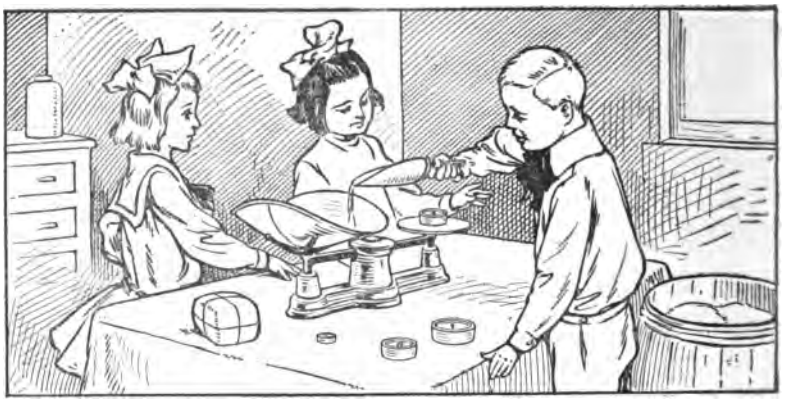
12. In 16 pints there are how many quarts?

13. In $\frac{1}{2}$ gallon there are how many quarts? gills?

14. 8 cents a quart for milk is how much a pt.? a gal.?

15. If a man walks 8 miles a day, how many miles will he walk in a week? in 11 days? in 12 days?

16. Picture in mind a square table 8 feet on a side. What is the distance around it?



84. This picture shows one of the forms of scales used by grocers for weighing small parcels; also the pound, half-pound, quarter-pound, and 1-ounce weights. The smallest weight shown is a 1-ounce weight.

We write **lb.** for pounds; **oz.** for ounces.

85. | **16 ounces equal 1 pound.** |

Oral Exercise

86. 1. Name some article that the grocer sells by the pound; by the ounce; by the pound and ounce.

2. What part of 16 oz. is 8 oz.? 4 oz.? 12 oz.?

3. How many ounces are there in $\frac{1}{2}$ lb. + $\frac{1}{4}$ lb. ?

4. How many half-pound packages can be made from 24 oz.?

5. What is the cost of 2 lb. of nails at 8¢ a pound?

6. Tea at 40¢ a pound costs how much for 8 oz.? for 4 oz.?

7. If 1 lb. of tea is divided into 8 equal parcels, how many ounces are there in each parcel?

87. **When a thing or a number is divided into 8 equal parts, we call one of the parts *1 eighth*, written $\frac{1}{8}$.**

8. $\frac{1}{8}$ pound of butter equals how many ounces?

9. How many pounds of nuts are there in 32 oz.?

Oral Exercise

88. 1. Walking 8 miles a day, how far can a man walk in a week and three days?

2. If I sell 8 stoves a day, how many is that for 6 days?

3. How many 2-gallon cans will 16 gallons of sirup fill?

4. How many ounces are there in $1\frac{1}{8}$ pounds? in $1\frac{2}{8}$ pounds? in $1\frac{3}{8}$ pounds? in $2\frac{1}{4}$ pounds?

5. There are 24 hours in a day. What part of a day are 12 hours? 6 hours? 3 hours?

6. $96 was divided equally among 8 small charities. How much was given to each?

Find the weight:

7. Of 1 pail if 8 pails of lard weigh 88 lb.

8. Of 1 gallon if $\frac{1}{8}$ of a gal. of water weighs 1 lb.; if $\frac{1}{4}$ gal. of milk weighs 2 lb.

9. Of 1 box if 8 boxes of soap weigh 32 lb.

Written Exercise

89. 1. How many tons of hay at \$8 a ton can be bought for \$104?

2. At 10 cents a pound for soup stock how many pounds can be bought for 125 cents?

3. 40 children are $\frac{1}{8}$ of a school. The whole school has how many children?

4. At \$8 each how many trunks can I buy for \$288?

5. How many 8-quart pails will hold 624 quarts?

6. The wages of a mason for 8 hours at 67¢ an hour are ——.

7. A man earns \$2.87 a day. How much will he earn in 8 days?

8. Find the cost of 8 yards of silk at \$1.95 a yard.

9. 8 lots of land were sold for \$675 each. How much did all bring?

Divide, and prove by multiplying:

	a	*b*	*c*	*d*	*e*	*f*
10.	4)64	4)86	4)92	4)780	4)325	4)\$866
11.	4)506	4)763	4)298	4)8750	4)\$0.96	4)231 in.
12.	8)568	8)432	8)614	8)312	8)872	\$8)\$351.

Multiply by 8, and prove by dividing:

	g	*h*	*i*	*j*	*k*	*l*
13.	235	409	687	767	809	1369
14.	287	432	909	615	854	876

90.

DRY MEASURE

2 pints = 1 quart, written 1 qt.
8 quarts = 1 peck, written 1 pk.
4 pecks = 1 bushel, written 1 bu.

Oral and Written Exercise

91. 1. Name some things that are sold by the bushel and peck.

2. One half a bushel equals how many pecks?

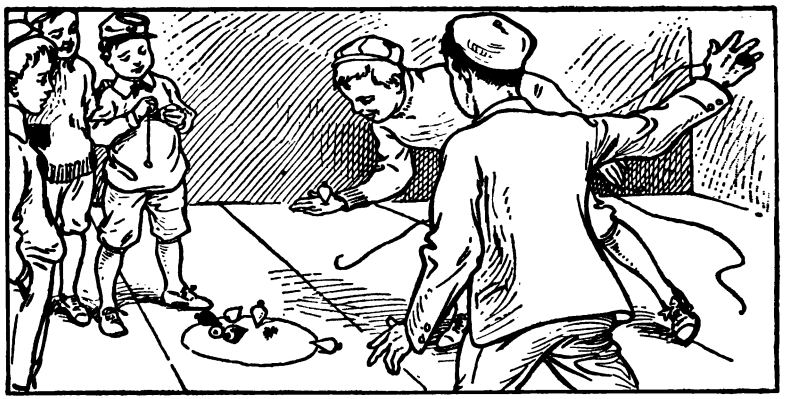
3. How many pecks are there in 1 bushel and a half bushel?

4. How many quarts are there in a peck? in a half peck? in one and a half pecks?

5. How many pints are there in 2 quarts?

6. How many quarts are there in 8 pints? in 6 pints?

7. At 6 cents a quart how much will $10\frac{1}{2}$ quarts of beans cost?



Oral Exercise

92. 1. Tom can make tops at a cost of 1 cent apiece, and sell them at 5 cents apiece. How much can he gain on 6 tops? on 9 tops?

2. Lewis swapped tops which cost him 8 cents each, for balls that he sells for 10 cents each. How much does he make on 8 tops?

3. What is the cost of 8 tops at 5 cents each with strings at 2 cents each?

4. What is the cost of 1 top if 8 cost 48¢? 56¢? 20¢?

5. A singing top costs 25 cents and a toy flute 15 cents. Give the sum and the difference of their costs.

6. James can make his top spin for 10 seconds. Fred's will spin twice as long and 2 seconds. How long will Fred's spin?

7. If 1 dozen tops cost 24 cents, how much will be gained on the lot by selling them at 3 cents each?

Written Exercise

93. 1. Write the date of the present year in Roman numerals.

2. If you give \$0.67 to each person, how much will 5 persons receive? How much will 10 persons receive?

3. If you divide \$864 equally between two persons, how much will each one get? How much will each one get if you divide it among 4 persons? among 8 persons? among 10 persons?

4. How many sheep at \$4 each can be bought for \$224?

5. How many 4-ounce bottles will contain as much as 1 hundred 2-ounce bottles?

What must be paid:

6. For 4 railroad fares at \$1.89 each?

7. For 5 railroad fares at \$6.74 each?

8. For 8 panes of glass at \$0.85?

9. For $\frac{1}{2}$ dozen chairs at \$36 a dozen?

10. How many dimes are there in \$18? how many cents in \$18?

11. How many dimes are there in 500 cents? in \$5?

12. In 28 pounds, there are how many $\frac{1}{2}$ pounds? how many $\frac{1}{4}$ pounds? how many $\frac{1}{8}$ pounds?

13. How many $\frac{1}{4}$ pounds are there in 24 oz.? how many $\frac{1}{8}$ pounds in 24 oz.?

Oral Exercise

94. 1. Count by 3's to 36, and back from 36 to 0.

2. Make a multiplication table of 3's as you made the table of 2's, page 27.

3. Repeat the table of 3's as you did the table of 2's.

4. Repeat forward and back, using 3 as the multiplier.

5. Multiply the following by 3 as rapidly as possible:

3 2 4 10 11 1 6 8 9 5 7 12

6. Multiply again, going in the opposite direction, and add to each product 1 or 2. Give only final results.

Divide each of the following by 3:

7. 6 12 3 9 18 15 30 27 21 24 33 36

8. 8 13 5 11 19 16 32 28 23 25 34 38

9. Change 2 yards to feet; \$3 to dimes; 3 ft. to in.

10. Change \$3 to 10-cent pieces; 3 nickels to cents.

11. Change 3 half-pounds to ounces; 3 weeks to days.

12. How much money will buy nine 3-cent papers?

13. 3 rails to a length, how many rails do 6 lengths of fence require?

14. What is the cost of 3 oranges at 5¢ each? at 6¢ each? at 4¢ each?

Written Exercise

95. Copy, divide by 3, and prove by multiplying:

	a	*b*	*c*	*d*	*e*	*f*
1.	174	295	361	840	104	\$0.99
2.	512	\$924	\$100	\$200	\$443	100¢

Written Exercise

96. Illustrative Example. Divide $7.50 by 3.

WORK

$$3\overline{)\$7.50}\quad\$2.50$$

EXPLANATION. We divide dollars and cents as we divide other numbers. Thus, $\frac{1}{3}$ of $7 is $2 with $1 undivided. The $1 undivided with 5 tens of cents makes 15 tens of cents; $\frac{1}{3}$ of 15 tens of cents is 5 tens of cents, or 50 cents. *Ans.* $2.50.

In writing the quotient, if there are dollars and cents, remember to separate them by a decimal point.

Copy and divide each of the following numbers by 2, 3, 4, 5, or 8 as the teacher directs:

	a	*b*	*c*	*d*	*e*	*f*
1.	$6.80	$7.20	$ 3.60	$6.30	$ 4.50	$3.60
2.	$7.90	$8.52	$10.98	$1.98	$14.85	$7.92

3. If 1 dozen chairs cost $14.40, how much will $\frac{1}{4}$ dozen cost? $\frac{1}{2}$ dozen? $\frac{1}{3}$ dozen?

What is the cost of 1 when

4. 3 hats cost $5.40?
5. 4 trees cost $4.20?
6. 4 pens cost $2.80?
7. 5 curtains cost $10.50?
8. 5 tubs cost $1.50?
9. 6 pails cost $1.80?
10. 10 pans cost $1.00?
11. 3 chairs cost $6.90?

Copy, divide, and add as in example 12:

12.	13.	14.
$9.60 ÷ 4 = $ 2.40	$1.52 ÷ 8 =	$5.75 ÷ 5 =
1.32 ÷ 4 = .33	7.76 ÷ 8 =	6.50 ÷ 5 =
$10.92 ÷ 4 = $ 2.73	÷ 8 =	÷ 5 =

Oral Exercise

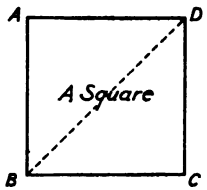


FIG. 1

97. 1. Fig. 1 is a **square.** It has —— equal sides and —— square corners. The corners are called **angles.** Square corners are called **right angles.**

98. If the side of the square is 1 inch long, the square is a **square inch.** If the side is 1 foot long, the square is a **square foot.** If it is 1 yard long, the square is a **square yard.**

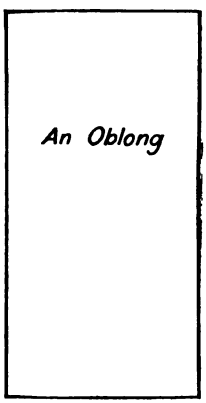


FIG. 2

99. A right-angled figure longer than it is wide, like Fig. 2, is an **oblong.**

100. Squares and oblongs are called **rectangles** because all their angles are right angles.

101. The dotted line, *BD*, Fig. 1, is called the **diagonal** of the square.

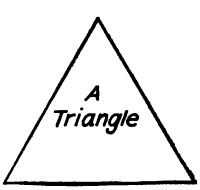


FIG. 3

2. A diagonal of a square divides the square into 2 equal parts. Each part has —— sides and —— corners, or angles.

102. A figure having 3 sides and 3 angles is a **triangle.**

3. Fig. 1 is 1 inch long and 1 inch wide. What is the distance around it?

103. The distance around a figure is called the **perimeter.**

4. The square, Fig. 1, may be described thus: Fig. 1 is a rectangle —— inch long and —— inch wide, its perimeter is —— inches and it contains —— square inch.

5. Measure the oblong and describe it.

6. What part of 1 square inch is each triangle in Fig. 1?

7. How long is the perimeter of Fig. 3?

Oral Exercise

104. 1. A wind blew away $\frac{2}{3}$ of the tail of Edward's kite. If 3 feet remained on the kite, how long was the tail at first?

2. To earn $12 in three weeks, how much must a boy earn each week?

3. A triangle of equal sides has a perimeter of 18 inches. What is the length of 1 side?

4. From $\frac{1}{2}$ dozen plums take $\frac{1}{3}$ dozen. To $\frac{2}{3}$ dozen add $\frac{3}{4}$ dozen.

5. Mary has 27 paper dolls. Helen has $\frac{1}{3}$ as many. How many has Helen? Compare the number both have with 3 dozen.

6. If 3 shrubs cost $1, how many will $10 buy?

7. An oblong measures 5 inches on the side and 3 on the end. What is its perimeter?

8. With 16 2-inch splints, how many 2-inch squares can be outlined? How many triangles can be outlined?

9. Divide 33 baskets of grapes equally among 3 customers. Each will receive —— baskets.

Oral Exercise

105. 1. Count by 3's to 36; by 6's to 72. Count back from 72 to 0 by 3's and by 6's.

2. Make a table of 6's as you made the table of 2's, page 27.

3. Repeat the table of 6's as you did the table of 2's.

4. Repeat forward and back, using 6 as the multiplier.

5. Multiply the following by 6 as rapidly as possible:

2 4 8 3 6 9 11 1 12 5 10 7

6. Multiply again, going in the opposite direction, and add to the product 1, 2, 3, 4, or 5, as the teacher may direct.

Divide each of the following by 6:

7. 12 18 6 24 30 60 36 48 42 66 54

8. 16 21 10 25 35 63 41 51 47 69 56

9. Review the tables of 2's, 10's, 5's, 4's, 8's, 3's.

10. Repeat the tables, using as multipliers, 2, 10, 5, 4, 8, 3.

11. If I buy 3 yards of ribbon at 6¢ a yard and give 2 dimes in payment, what change should I get?

12. 6 nickels and 6 dimes are equal to how many cents?

13. How many eggs are there in 4 boxes of $\frac{1}{2}$ dozen each? in 6 boxes of 1 dozen eggs each?

14. A train runs at the rate of 3 miles in 5 minutes. How far does it go in 30 minutes? in 40 minutes? in 60 minutes?

Written Exercise

106. 1. Afters pending $\frac{2}{3}$ of my money I had \$36 left. How much had I at first?

2. To save \$219 in 3 years, how much must a man save each year?

3. If my savings for three months are \$68, how much should they be for twice as long?

4. A man sold 3 barrels of walnuts for \$6.75. What was the price per barrel?

5. A dealer in bicycles sold 6 at \$24 each. How much did they bring?

6. How many seats are there in 6 schoolrooms having 39 seats each?

7. What sum of money will give 6 boys 68 cents each?

Divide the following by 3, and prove by multiplying:

	a	*b*	*c*	*d*	*e*	*f*
8.	663	579	828	765	\$3.96	\$32.70
9.	328	167	594	830	\$0.69	\$7.00

Multiply each of the following by 6, and prove:

	g	*h*	*i*	*j*	*k*	*l*
10.	507	291¢	79 lb.	\$2.19	\$0.58	\$3.46
11.	834	767¢	86 lb.	\$8.67	\$0.69	\$6.89

12. Walter has \$4.57; Carroll has 5 times as much. How much have both?

13. How many hours will it take a horse traveling 6 miles an hour to go as far as an automobile can go in 3 hours, going at the rate of 20 miles an hour?

Oral Exercise

107. 1. How many 6's are there in 18? in 36? in 48?

2. Name any 2 numbers which multiplied together give the following products:

6 42 12 18 54 30 36 66 60 72 24 48

3. In a yard there are how many ft.? how many in.?

4. How many inches are there in $\frac{1}{3}$ of a yard?

5. What part of a yard is 9 in.? 12 in.? 6 in.?

6. If we divide a yard into 6 equal parts, what shall we call one of the parts? 1 part contains how many inches?

108. **One of the 6 equal parts of a thing or a number is *1 sixth* of it, written $\frac{1}{6}$.**

7. Write in figures, 1 third, 1 fifth, 1 eighth, 1 sixth.

8. What is $\frac{1}{6}$ of 30? of 24? of 48? of 54? of 72?

9. 3 is $\frac{1}{6}$ of ——. 11 is $\frac{1}{6}$ of ——. 10 is $\frac{1}{6}$ of ——. 9 is $\frac{1}{6}$ of ——.

10. 48 cords of wood in 6 equal piles is how many cords to a pile?

Written Exercise

109. Copy, and give quotients and remainders:

	a	*b*	*c*	*d*	*e*
1.	$6\overline{)84}$	$\$6\overline{)\$96}$	$6\overline{)\$1.08}$	$6\overline{)\$7.50}$	$6\overline{)\$15.00}$
2.	$\frac{1}{5}$ of 185	$\frac{1}{3}$ of 437	$\frac{1}{4}$ of \$9.72	$\frac{1}{8}$ of 216	$\frac{1}{8}$ of \$15.44

Oral Exercise

110. 1. Ida has $\frac{1}{3}$ of an apple and Charlotte has $\frac{2}{3}$ of an apple. They both have —— thirds.

2. $\frac{1}{3}+\frac{2}{3}=$ ——; $\frac{1}{4}+\frac{1}{4}=$ ——; $\frac{3}{5}+\frac{2}{5}=$ ——; $\frac{3}{8}+\frac{3}{8}=$ ——.

3. Theodora studied for $\frac{2}{3}$ of an hour and recited for $\frac{2}{3}$ of an hour. How long did she study and recite?

4. From a piece of ribbon $\frac{3}{4}$ of a yard long cut off $\frac{1}{4}$ of a yard. How much is left?

5. $\frac{3}{4}-\frac{1}{4}=$ ——; $\frac{3}{2}-\frac{1}{2}=$ ——; $\frac{4}{5}-\frac{2}{5}=$ ——; $\frac{5}{6}-\frac{2}{6}=$ ——; $\frac{8}{9}-\frac{5}{9}=$ ——.

6. $\frac{1}{3}$ of a basket of blueberries was used for a pie. What part was left?

7. Oscar had $\frac{3}{4}$ of a dollar and spent $\frac{1}{4}$ of a dollar for a base ball. How much had he left?

8. In 1 there are how many halves? $1\frac{1}{2}=$ —— halves; $1\frac{3}{4}=$ —— fourths; $1\frac{4}{5}=$ —— fifths; $1\frac{3}{8}=$ —— eighths.

9. From $1\frac{1}{3}$ yards of a chain $\frac{2}{3}$ yard is sold. What part of a yard is left? How many feet are left?

Supply the missing numbers in the following:

10. $\frac{5}{6}+\frac{3}{6}+\frac{1}{6}=$ ——
11. $\frac{8}{9}+\frac{1}{9}+\frac{4}{9}=$ ——
12. $\frac{2}{7}+\frac{5}{7}+\frac{1}{7}=$ ——
13. $\frac{3}{5}+\frac{1}{5}+\frac{1}{5}=$ ——
14. $\frac{7}{9}-\frac{4}{9}=$ ——
15. $\frac{11}{7}-\frac{5}{7}=$ ——
16. $\frac{6}{8}-\frac{3}{8}=$ ——
17. $\frac{4}{5}-\frac{3}{5}=$ ——
18. $\frac{7}{5}=1_{\frac{}{5}}$;
19. $\frac{6}{4}=1_{\frac{}{4}}$;
20. $\frac{8}{3}=2_{\frac{}{3}}$;
21. $\frac{9}{3}=$ ——
22. $\frac{5}{8}+\frac{5}{8}+\frac{5}{8}=\frac{}{8}=1_{\frac{}{8}}$
23. $1\frac{7}{8}+\frac{3}{8}=1_{\frac{}{8}}$
24. $\frac{4}{5}+\frac{3}{5}+\frac{2}{5}+\frac{3}{5}=$ ——
25. $3\frac{5}{6}-2\frac{2}{6}=1_{\frac{}{6}}$

Oral Exercise

111. 1. Count by 3's, by 6's, and by 9's from 0 to 108, and back from 108 to 0.

2. Make a table of 9's as you made the table of 2's on page 27.

3. Repeat the table as you did the table of 2's.

4. Repeat, using 9 as the multiplier.

5. Multiply 9 by the following numbers:

3 6 8 5 2 4 7 9 1 11 10 12

6. Multiply the above from left to right by 9.

7. Multiply from right to left and add to the products 2, 3, 4, or 5, as the teacher directs.

8. At \$9 a week for board what is the cost of board for 8 weeks? for 7 weeks?

9. What is the cost of 9 chairs at \$6 each? of 6 chairs at \$9 each?

10. Describe a 3-inch square as in Example 4, page 51.

11. Describe a 6-inch square; a 9-inch square.

Written Exercise

112. 1.

21	39	48	57	62	76	\$7.30	\$0.84
×9	×9	×9	×9	×9	×9	×9	×9

2. A bushel of grass seed weighs 60 lb. How much will 9 bushels weigh?

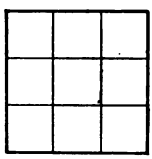
3. In 9 strips of carpeting of 15 yards each there are how many yards?

Oral Exercise

113. 1. Draw upon the blackboard a horizontal line 1 yard long. How many feet long is this line?

2. Draw upon this line an oblong 1 foot wide. How many square feet does this oblong contain? Draw vertical lines to show the square feet.

3. The picture represents 3 such oblongs as you drew. How many square feet do the 3 oblongs contain? $3 \times 3 = ?$



114. **9 square feet = 1 square yard, written 1 sq. yd.**

4. Measure some object in your schoolroom and find how many square feet it contains.

5. If a table top is a rectangle and measures 6 ft. long and 3 ft. wide, how many square feet are there in it? How many yards long is the table top? How many square yards are there in it?

6. What part of a square yard are 3 square feet? 6 square feet?

7. 1 square foot is contained in 1 square yard how many times?

8. What part of a square yard is 1 square foot?

115. **One of the 9 equal parts of a thing or a number is *1 ninth* of it, written $\frac{1}{9}$.**

9. What is $\frac{1}{9}$ of 27? of 36? of 108? 45? 54? 63? 81?

10. What is $\frac{1}{9}$ of 28? of 37? of 109? 47? 55? 66? 87?

Oral Exercise

3	5	2	4
1	10	7	9
6	8	11	12
27	36	90	54
45	18	72	63
108	81	99	9

116. 1. Tell what number 3 is $\frac{1}{3}$ of; $\frac{1}{6}$ of; $\frac{1}{9}$ of. Each of the other numbers in the upper half of the chart is $\frac{1}{3}$ of what? $\frac{1}{6}$ of what? $\frac{1}{9}$ of what?

2. Change each number in the upper half of the chart to 4ths; to 5ths; to 9ths.

3. Each number in the lower half of the chart is how many 9's?

4. Each number in the lower half of the chart is how many 10's, with what remainder?

Divide each of the following numbers by 9:

5. 27 45 63 81 36 54 18 99 72 90 108

6. 31 50 70 84 43 60 24 104 80 97 115

Written Exercise

117. 1. A schoolroom has 9 windows, each containing 18 square feet of glass. How many square feet have all?

2. Find the cost of a 3-pound roast of beef at 27¢ a pound; of a 9-pound roast; of a 10-pound roast.

Copy, perform, and prove the following:

	a	*b*	*c*	*d*	*e*	*f*
3.	135	324	246	367	468	$15.69
	× 9	× 9	× 9	× 9	× 9	× 9
4.	9)1570	9)3577	9)2567	9)$44.68	9)$54.73	9)$67.50

Oral and Written Exercise

118. 1. Count by 7's from 7 to 84, and back from 84.

2. Make a table of 7's as you made the table of 2's.

3. Repeat the table of 7's as you did the table of 2's.

4. Repeat, using 7 as the multiplier.

5. Multiply 7 rapidly by the following:

3 6 8 5 4 2 7 9 1 10 11 12

6. Multiply the above from left to right by 7.

7. Multiply from right to left and add 2, 3, 4, or 5, as the teacher directs, naming only the sums.

Divide each of the following numbers by 7:

8. 21 42 28 35 49 14 56 63 70 84 77

9. 24 45 31 39 52 20 57 65 75 90 80

Copy, multiply, and add as in *a*:

	a	*b*	*c*	*d*
10.	$23 \times 7 = 161$	$83 \times 7 =$	$57 \times 7 =$	$28 \times 7 =$
	$45 \times 7 = 315$	$46 \times 7 =$	$19 \times 7 =$	$95 \times 7 =$
	$68 \times 7 = 476$	$\times 7 =$	$\times 7 =$	$\times 7$
11.	$77 \times 3 = 231$	$77 \times 5 =$	$77 \times 1 =$	$87 \times 8 =$
	$77 \times 4 = 308$	$77 \times 5 =$	$77 \times 9 =$	$87 \times 2 =$
	$77 \times 7 =$	$77 \times \ =$	$77 \times \ =$	$87 \times \ =$

Copy, give quotients and remainders, and prove:

	e	*f*	*g*	*h*	*i*	*j*
12.	$7\overline{)847}$	$7\overline{)168}$	$7\overline{)112}$	$7\overline{)299}$	$7\overline{)490}$	$7\overline{)569}$
13.	$7\overline{)465}$	$7\overline{)406}$	$7\overline{)414}$	$7\overline{)264}$	$7\overline{)106}$	$7\overline{)913}$

Oral Exercise

119. 1. How many days are there in a week? How many school days are there in a week? in 4 weeks?

2. How many school days are there in 2 weeks? in 6 weeks?

3. In a school month of 20 days James was absent $\frac{1}{4}$ of the time. How many days was he absent?

4. If Madge has 5 classes every day, how many has she in a school week? in 2 school weeks?

5. Helen is absent 2 days one week, 3 days the next, 3 days the next, and 2 the next. How many days is she absent in the 4 weeks?

6. If school begins at 9 o'clock and closes at 11.30, how many hours are there in the forenoon session?

7. How many days are there in 9 weeks, 3 days?

8. 5 weeks = —— days. 7 school weeks = —— days.

9. $9 \times 7 = 7 \times$ ——. $8 \times 7 = 7 \times$ ——. $7 \times$ —— $= 6 \times 7$.

10. How many weeks are there in 21 days? in 49 days?

11. Mr. Brown is 42 years old and is 7 times as old as his son Fred. How old is Fred?

12. I have 56 bushels of apples to divide equally and put in 7 bins. How many bushels shall I put in each bin?

13. A railroad conductor makes 7 trips a day. In how many days will he make 77 trips?

14. An electric car has 7 seats, and in it are 35 persons. If they are equally distributed, how many are there to a seat?

Written Exercise

120. 1. There are 32 quarts in 1 bushel. How many quarts are there in 7 bushels?

2. In 25 weeks there are how many days?

3. Luke counted 32 seeds in 1 gripe fruit. How many seeds at the same rate would 7 gripe fruits have?

4. At $7 each, how many desks can I buy for $245?

5. Ada can write her name 7 times in 1 minute. How many minutes will it take her to write it 245 times?

6. My monthly bill for milk was $4.76. The milk was 7 cents a quart. How many quarts were charged?

7. A family's meals for a week cost $15.47. What was the average cost a day?

8. A traveler spent $24.53 in a week. What was the average per day?

Copy, multiply, and prove by dividing:

	a	*b*	*c*	*d*	*e*
9.	$3.54	$8.90	$5.34	$6.78	$7.59
	×2	×2	×3	×3	×4
10.	$4.86	$7.69	$1.75	$8.29	$4.27
	×4	×5	×6	×6	×7
11.	$3.81	$4.68	$9.37	$6.34	$8.19
	×7	×8	×8	×9	×9

Copy, divide, and prove:

12. 3)$3.87 4)$8.36 6)$3.46 7)$10.78 8)$5.36

Written Exercise

121. Multiply, and write the products:

	a	*b*	*c*	*d*
1.	5×10	$\$4 \times 10$	$\$11 \times 10$	$\$6.55 \times 10$
	50×10	$\$40 \times 10$	$\$1.10 \times 10$	$\$0.65 \times 10$

2. In multiplying 5 and 50 by 10, what figure is written after the 5 and 50 to express the products?

3. In multiplying, as in *c* and *d*, \$1.10, \$6.55, and \$0.65 by 10, what change made in the place of the decimal point gives the product?

To multiply by 10 *annex a* 0 *to the figures of the multiplicand, and if there is a decimal point in the multiplicand, move it one place to the right in the product.*

Oral Exercise

122. Multiply at sight:

	a	*b*	*c*	*d*
1.	$\$36 \times 10$	$\$0.75 \times 10$	$\$4.23 \times 10$	$\$8.64 \times 10$
2.	$\$3.60 \times 10$	$\$0.97 \times 10$	$\$7.30 \times 10$	$\$4.32 \times 10$
3.	$\$2.93 \times 10$	$\$0.64 \times 10$	$\$3.41 \times 10$	$\$0.25 \times 10$
4.	$\$65 \times 10$	$\$4.87 \times 10$	$\$35 \times 10$	$\$0.50 \times 10$
5.	$\$6.50 \times 10$	$\$2.34 \times 10$	$\$16.54 \times 10$	$\$0.60 \times 10$

6. At 50 cents each, what is the cost of 10 lamps?

7. If 2 collars cost 25 cents, how much will 20 cost?

8. At \$2 a qt., what is the cost of 10 qt. of olive oil?

9. A bushel of rye weighs 56 pounds. 10 bushels weigh —— pounds.

Oral Exercise

123. 1. If $11 \times 2 = 22$, then $2 \times 11 =$ what?

2. Give the products of the following at sight:

11×1	11×2	11×3	11×4	11×5
1×11	2×11	3×11	4×11	5×11
11×6	11×7	11×8	11×9	11×10
6×11	7×11	8×11	9×11	10×11

3. Make a table of 11's as you made the table of 2's, page 27, and memorize it. Count by 11's from 11 to 132.

4. Give the products of the following at sight:

12×1	12×2	12×3	12×4	12×5
1×12	2×12	3×12	4×12	5×12
12×6	12×7	12×8	12×9	12×10
6×12	7×12	8×12	9×12	10×12

5. Make a table of 12's. Count by 12's from 12 to 144.

6. Multiply 11 as rapidly as possible by each of the following numbers:

3 4 8 5 2 3 7 9 1 11 10 12

7. Multiply 12 by each of the above numbers.

8. Multiply each of the above numbers (Ex. 6) first by 11 and then by 12.

9. Divide at sight by 11:

55 66 77 121 110 132 58 70 82

10. Divide at sight by 12:

24 98 60 72 108 120 144 36 30 19

Oral Exercise

124. 1. If a locomotive consumes 5 tons of coal a day, how much does it burn in 11 days? in 12 days?

2. Eleven six-inch lines will reach —— inches. 11 ten-inch lines will reach —— inches. 11 eleven-inch lines will reach —— inches.

3. A box of sewing silk contains 12 dozen spools. It has —— spools.

4. If 11 cords of wood cost $55, 6 cords cost ——.

Written Exercise

125. 1. If a street car earns an average of $30 per day, how much does it earn in 7 days?

2. If one freight car carries 27 tons of coal, how many tons will 10 such cars carry?

3. How much do the fares amount to from 6 passengers at 11 cents each? from 60 passengers at 11 cents each?

4. If a street car conductor receives $2.50 per day, how much does he receive in 9 days? in 10 days?

5. If the freight rate for a certain distance is $48.50 per car, how much will it be for 6 cars? for 9 cars?

What is the cost:

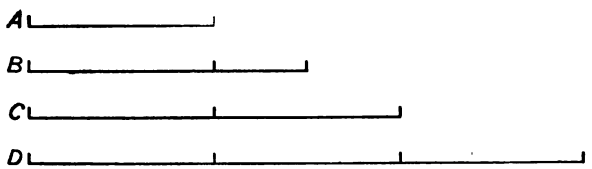
6. Of 54 yards of sheeting at 7 cents a yard?

7. Of 12 yards of lace at 37 cents a yard?

8. Of 11 yards of canton flannel at 19 cents a yard?

9. Of 12 yards of taffeta silk at $1.10 a yard?

Oral Exercise



126. 1. If A is 1 foot, how many feet is D?

2. If A is 1 inch long, how many inches is C? B? D?

3. If A is 1 yard, how many yards is C? If A is worth 1 dollar, how much is C worth?

4. If B is 1 yard of silk and costs \$ 2, how much will A cost? how much will C cost? how much will D cost?

5. If C is 24 yards long, how long is A? B? D?

6. If D is 12 yards of carpet and costs \$ 3 a yard, what is its value? what will A cost? B? C?

7. If A is 1 foot, how many inches is B? C? D?

8. If D is $1\frac{1}{2}$ feet, how many feet is C? B? A?

Written Exercise

127. 1. A square garden is 46 feet on each side. What is the entire distance around it?

2. What is the value of 9 rugs at \$ 65 each?

3. If a man walks a mile in 18 minutes, in what time will he walk 8 miles?

4. A carpet contains 9 square yards. At \$ 4.50 a square yard, how much does it cost?

Written Exercise

128. 1. A farmer has 19 trees which yield 3 bushels of apples per tree. What is the total yield?

2. A field of oats contains 6 acres and produces 25 bushels to the acre. How many bushels does it produce?

3. A piece of land yielded 4 tons of hay which sold for $18 a ton. How much did it sell for?

4. If it cost $15.60 for fertilizer, planting, cultivating and seed, how much was the profit on a lot of potatoes that sold for $36.25?

5. A farmer's live stock consists of 8 cows valued at $48 each, of 2 horses valued at $125 each and of 9 hogs at $15 each. What is the total value of his live stock?

6. A farmer buys a horse rake for $27.50. He is allowed $12.75 for his old rake and pays the difference in money. How much money does he pay out?

Written Exercise

129. Write the products of the following:

1.	2.	3.	4.	5.	6.	7.	8.
12	34	26	160	$75	$0.87	$0.29	$9.30
× 10	10	10	10	10	10	10	10

9. What is the cost of 10 feet of drain pipe at $0.38 a foot, of 10 barrels of cement at $2.75 per barrel, and of 10 hours' work at 25 cents an hour?

130. Illustrative Example. Multiply 12 by 20.

WORK

12 multiplicand
20 multiplier
240 product

EXPLANATION. 20 = 2 tens. 12 multiplied by 2 ones = 24. 12 multiplied by 2 tens = 240. We multiply by 10's as by 1's and annex a 0 to show that the product is 10's. *Ans.* 240.

Copy, and write the products:

10.	11.	12.	13.	14.	15.	16.	17.
38	29	54	81	75	67	84	64
20	20	30	40	50	60	70	90

131. Illustrative Example. Multiply 12 by 34.

WORK

12 multiplicand
34 multiplier
48 product by 4
360 product by 30
408 product by 34

EXPLANATION. To multiply by 34 we multiply by 4 and by 30 (3 tens) and then add the partial products.

The product by 4 ones is 48 ones. The product by 3 tens is 36 tens, or 360. Adding the partial products we find that the final product is 408. *Ans.* 408.

To prove, multiply the multiplier by the multiplicand.

Written Exercise

132.

	a	*b*	*c*	*d*	*e*	*f*
1.	48 × 21	97 × 53	62 × 73	96 × 52	24 × 93	783 × 53
2.	53 × 14	94 × 75	97 × 43	38 × 44	72 × 98	469 × 74
3.	91 × 76	174 × 96	385 × 63	89 × 60	650 × 89	493 × 98
4.	$25.02 × 80	$28.15 × 65	$62.14 × 48	$36.75 × 65	$16.84 × 37	$6.39 × 39

5. How many bushels of corn can be harvested from 12 acres if each acre yields 45 bushels?

6. Find the cost of 15 house lots at $750 each.

7. A street railway car earns $29.75 a day. How much will it earn in 3 days? in 30 days?

8. A square plot of ground is 187 feet on each side. What is the entire distance (perimeter) around the 4 sides?

9. If a man earns $52 per week, how much does he earn in a year of 52 weeks?

10. How many 10-penny nails are there in 38 lb. if there are 88 nails in 1 pound?

Multiply the following in lines and in columns:

	g	*h*	*i*	*j*	*k*
11.	25 × 56	63 × 92	58 × 45	24 × 98	79 × 67
12.	93 × 62	47 × 25	89 × 56	67 × 74	94 × 89

Oral Exercise

133. 1. An orchard of 84 trees, 12 trees in a row, has how many rows of trees?

2. If 11 feet of iron pipe cost $1.10, 1 foot costs ——.

3. Add to 108 eggs $\frac{1}{3}$ as many more.

4. In 81 square feet there are how many square yards?

Written Exercise

134. 1. If school keeps 5 hours per day, how many school hours are there in 40 weeks of 5 days each?

2. If there are in a city 150 schools and an average of 40 pupils in each school, how many pupils are there?

3. If a train runs 42 miles an hour, how many miles will it run in 24 hours?

4. Clifford sells 74 newspapers each day. How many does he sell in 6 days? in 10 weeks of 6 days each?

5. How much must be paid for 15 subscriptions to the *Youth's Companion* at $1.75 each?

6. How many yards are there in 35 rolls of carpeting of 44 yards each?

What is the cost:

7. Of 4 dozen collars at 15 cents apiece?

8. Of 119 pounds of butter at 24 cents a pound?

9. Of 37 crates of pineapples at $3.87 a crate?

10. Of 17 bushels of potatoes at $0.84 a bushel?

11. Of 18 typewriters at $85 each?

Oral Exercise

135. Count by:

1. 2's from 2 to 12
2. 20's from 20 to 120
3. 30's from 30 to 120
4. 20's from 1 to 121
5. 10's from 1 to 101

Add by:

6. 4's from 4 to 20
7. 40's from 40 to 200
8. 5's from 5 to 50
9. 50's from 50 to 500
10. 50's from 1 to 251

a

11. $12 \times 2 = —$ $2 \times 12 = —$
    $13 \times 2 = —$ $2 \times 13 = —$
    $14 \times 2 = —$ $2 \times 14 = —$
    $15 \times 2 = —$ $2 \times 15 = —$

b

12. $16 \times 2 = —$ $2 \times 16 = —$
    $17 \times 2 = —$ $2 \times 17 = —$
    $18 \times 2 = —$ $2 \times 18 = —$
    $20 \times 2 = —$ $2 \times 20 = —$

13. $100 = —$ 50's $100 = —$ 2's
    $100 = —$ 25's $100 = —$ 4's
    $100 = —$ 20's $100 = —$ 5's

14. $120 = —$ 10's $= —$ 12's
    $120 = —$ 3's $= —$ 30's
    $120 = —$ 4's $= —$ 40's

15. How many 12's are there in 120? 11's in 121?

16. 12's in 24? 13's in 26? 14's in 28? 15's in 30?

17. 16's in 32? 18's in 36? 20's in 40? 40's in 80?

18. Begin with 10 and count on by 6's to 64. Count off by 6's from 66 to 0.

19. Begin with 9 and count on by 7's to 93. Count off by 7's from 93 to 2.

20. Begin with 7 and count on by 5's to 67. Count off by 5's from 67 to 0.

21. Multiply each of the following by 4, 5, 6, 7, 8, 9, and add 3 to the products:

7 9 8 6 5 10 12 3 11 2 4

Written Exercise

136. 1. The number of pupils in five different schools is as follows: 346 pupils, 511 pupils, 604 pupils, 157 pupils, and 216 pupils. How many pupils are there in all?

2. Find the amount of the following charges: for Geographies, \$66; Arithmetics, \$102; Spelling books, \$24.56; Copy books, \$12.60; Language books, \$48.12.

3. A merchant's daily sales for a week were as follows: Monday, \$175.10; Tuesday, \$201; Wednesday, \$193.65; Thursday, \$216.42; Friday, \$160.20; Saturday, \$275.87. What was the amount of the week's sales?

4. During the months of the busy season, a farmer pays out the following amounts for help: in April, \$100; in May, \$160; in June, \$205; in July, \$360; in August, \$200; in September, \$130; in October, \$95. How much does he pay out in all for help?

5. In building a carriage house, Mr. Baxter spent the following amounts: for lumber, \$650; for carpenter's work, \$425.25; for hardware, \$96.50; for painting, \$60. How much did it cost?

Copy, add, and prove:

6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
23	53	85	51	58	56	35	95	375	563
44	35	67	62	53	12	43	19	384	308
53	59	31	79	60	39	68	47	483	600
45	73	64	14	96	80	49	76	170	565
36	34	97	90	92	76	58	91	167	489
24	63	78	85	75	69	69	47	500	464

Oral and Written Exercise

137. 1. Roy made 4 kites at a cost of 16 cents each; he sold 2 for 30 cents each, and 2 for 20 cents each. Did he gain or lose, and how much?

2. Herbert's kite string is made in four sections of 75 feet each. How long is it?

3. Chauncey's kite string is 387 feet long and John's is 420 feet long. Which is longer, and how much?

4. A kite costs Orrin 10 cents for a string, 5 cents for paper, 5 cents for a frame, and 10 cents for a bottle of paste. How much does his kite cost him?

5. Robert buys a kite for 20 cents, and sells it so that he gains 10 cents. For how much does he sell it?

6. It cost Roy 75 cents to make five kites which he sold for 60 cents. How much did he make or lose on the lot?

7. Edwin swapped a 25-cent kite for a baseball, which he sold for 50 cents. How much money did he make?

Copy, add, and prove:

	a	*b*	*c*	*d*	*e*	*f*	*g*
8.	217	984	201	698	799	287	278
	644	507	980	799	796	857	650
	624	389	175	108	547	536	685
9.	671	257	616	400	987	995	179
	252	512	248	958	344	657	304
	600	384	497	991	778	647	765
	305	614	507	999	258	658	694
	790	835	101	864	646	259	418

Oral Exercise

138. 1. Donald buys 2 cents' worth of marbles at 5 for 1 cent. How many does he get?

2. How many could he get for 4 cents? for 3 cents?

3. Chester had 16 marbles, but gave away $\frac{1}{4}$ and lost $\frac{1}{2}$ of them. How many had he left?

4. If blood alleys cost 2 cents each, how many can be bought for 40 cents?

5. How many marbles at 5 for a cent will pay for 3 blood alleys at 2 cents apiece?

6. Here is a marble board. Winthrop and Dexter have a game of "roll the marble" and make the score as follows:

Winthrop,	3,	1,	2.	3,	1.	1,	3,	3,	1.	1
Dexter,	1,	1,	1.	3.	3,	3,	1,	2,	1,	3

What are the totals? Which one wins?

7. In a second game the score stands as follows:

Winthrop,	3,	3,	1,	1,	2.	1,	3,	2,	3,	1
Dexter,	2,	1,	3,	3,	1,	2,	1,	3,	2,	1

Which one beats, and by how much?

Written Exercise

139. Copy, subtract in columns, and add in lines:

1.	2.	3.	4.
$64+92=156$	$65+85=$	$1282+1383=$	$1051+1373=$
$17+29=$ 46	$28+27=$	$279+$ $904=$	$435+$ $665=$
$47+63=$	$+$ $=$	$+$ $=$	$+$ $=$

Written Exercise

140. Copy and add the following:

1.	2.	3.	4.	5.
$32	$6.16	$2.35	$4.15	$75.31
45	.34	1.22	.95	9.64
108	.28	4.61	.21	14.52
17	1.27	2.11	1.46	54.98

Notice that for the addition above, the cents are written under *cents* and the dollars under *dollars*.

6. A set of boxing gloves costs $2.75. What will be the change for two $2 bills?

7. A box of toilet soap costs 25¢, a tooth brush 35¢, a package of tooth powder 25¢, and a nail brush 40¢. What change will be given for a $5 bill?

8. If two books cost $1.25 each, how much change will be given for two $10 bills?

9. A dealer sells a chair for $16.50. What change does he give for two $10 bills?

10. Find the cost of a coat at $10.50, gloves at $.75, handkerchiefs at $2, shoes at $2, and a hat at $2.50.

11. A man buys a garden rake for $.50, a spade for $1.25, a hoe for $.75, a fork for $.90, a wheelbarrow for $8. What is the total cost?

12. The repairs on a house cost as follows: Painting outside, $110; painting inside, $64.45; shingling, $56; papering, $37, plumbing, $43.60. What was the total cost?

Written Exercise

141. The following sales were made in a department store on the first five days in January. Copy, and find the sum of each day's sales. Find also the sum of the sales on each item, 6, 7, 8, etc.

		1.	2.	3.	4.	5.
6.	Dress goods	$35.86	$64.58	$25.25	$25.29	$279.48
7.	Underwear	$21.82	$59.31	$44.78	$37.57	$47.84
8.	Bedding	$17.10	$68.62	$37.68	$49.65	$453.61
9.	Shoes	$50.07	$85.48	$53.13	$98.03	$17.76
10.	China	$80.00	$19.24	$18.35	$168.74	$14.84

11. Find the total amount of the sales.

The following sales were made in a variety store in five successive days. What was the amount of the sales for each day, and for each item, 17, 18, 19, etc.?

		12.	13.	14.	15.	16.
17.	Shoes	$26.45	$13.45	$38.95	$84.98	$62.19
18.	Glass	$44.80	$26.37	$75.74	$93.63	$66.51
19.	Crockery	$28.31	$42.38	$38.67	$39.89	$49.85
20.	Woolens	$43.29	$40.62	$91.73	$59.85	$76.58
21.	Sheets	$71.34	$45.60	$24.63	$69.39	$44.75
22.	Tins	$68.37	$46.58	$66.78	$25.75	$54.77
23.	Cutlery	$70.62	$48.26	$75.94	$33.37	$86.96
24.	Hats	$6.50	$12.32	$32.17	$19.49	$42.58

25. Find the total amount of the sales.

Written Exercise

142. Copy, subtract in columns, and add in lines:

	a	*b*	*c*
1.	$75+85=$	$66+86=$	$396+198=$
	$26+49=$ ___	$38+57=$ ___	$139+169=$ ___
	$+\quad=$	$+\quad=$	$+\quad=$
2.	$53+264=$	$75+286=$	$297+308=$
	$44+205=$ ___	$16+227=$ ___	$238+249=$ ___
	$+\quad=$	$+\quad=$	$+\quad=$

Copy, add in columns, and subtract in lines:

3.	$85-49=$	$96-39=$	$242-183=$
	$66-28=$ ___	$198-169=$ ___	$253-194=$ ___
	$-\quad=$	$-\quad=$	$-\quad=$

4. If I earn $90 per month and spend $65 of it for living expenses, how much have I left?

5. Mr. Winn bought a horse for $350 and sold it for $279. How much did he lose?

6. From $854 take $695.

7. There were 344 pupils in school yesterday. There are 361 to-day. How many more are there in school to-day?

8. There are 362 bushels of apples in two bins. One bin contains 184 bushels. How many are there in the other bin?

9. I have $425, but I owe $275 of it. How much shall I have left after paying what I owe?

10. A man started on his vacation with $200. He spent all of it but $63. How much did he spend?

Oral Exercise

143. 1. If a train leaves a station at 6:30 o'clock and arrives at the next station 1 hour and a quarter later, at what time does it arrive?

2. If there are 5 days in a school week with a recess of 15 minutes in the forenoon and 15 minutes in the afternoon, there are how many hours of recess in a week?

144. 3. The time from one tick of a common clock to the next is called a second. Repeat the table of time measure.

4. How many seconds are there in 9 minutes? in 10 minutes? in $\frac{1}{2}$ minute? in $\frac{1}{4}$ minute?

TIME MEASURE

60 seconds	= 1 minute (min.).
60 minutes	= 1 hour (hr.).
24 hours	= 1 day (da.).
7 days	= 1 week (wk.).
52 weeks 1 day 365 days 12 months	= 1 year (yr.).

Written Exercise

145. 1. How many weeks are there in 2 years? How many days are there in 2 years?

2. How many hours are there in 1200 minutes?

3. How many minutes are there in 1 day? in 12 days?

4. How many minutes equal 5 hours? 8 hours? $\frac{1}{2}$ an hour? $1\frac{1}{2}$ hours?

Oral Exercise

146. 1. Learn the names of the months in order, thus: January, February, March, April, May, June, July, August, September, October, November, December.

2. How many months are there in 1 year? in $1\frac{1}{2}$ years?

3. What part of one year is 4 mo.? 3 mo.? 2 mo.?

4. Learn the following:

Thirty days have September,
April, June, and November;
All the rest have thirty-one,
Except February alone,
To which we twenty-eight assign,
Till leap year gives it twenty-nine.

5. Name the 4 months that have 30 days each.

6. Name in order the months that have 31 days each.

7. How many days are there in February in a common year? in a leap year?

8. How many months is it from January 1 to April 1? from January 10 to July 10? from January 5 to October 5?

Written Exercise

147. 1. How many days is it from January 1, 1907 to March 1, 1907? from June 1, 1907 to August 1, 1907? from January 1, 1907 to March 15, 1907?

2. How many days is it from April 1 to July 4? from January 1 to your next birthday?

3. At \$18 a month, what is the rent of a store from September 1, 1906 to December 1, 1907?

Written Exercise

148 Copy and subtract the following, and prove:

	a	*b*	*c*	*d*	*e*	*f*
1.	\$11.91	\$25.75	\$11.41	\$53.76	\$12.52	\$13.63
	8.44	21.92	9.35	46.00	4.36	5.07
2.	\$82.65	\$11.34	\$11.18	\$18.53	\$49.72	\$17.44
	36.43	6.15	1.14	8.91	38.46	7.51
3.	\$15.85	\$57.27	\$17.37	\$24.78	\$25.79	\$45.11
	6.48	26.46	8.75	14.88	15.94	36.32
4.	\$46.98	\$96.19	\$31.51	\$74.43	\$20.67	\$19.08
	28.64	89.71	27.39	25.48	16.58	12.08
5.	\$79.84	\$53.87	\$65.07	\$14.06	\$81.16	\$38.84
	46.87	47.89	50.28	7.69	18.07	23.45

6. My coal bill for 1904 was \$135.30, for 1903 it was \$110.25. Find the difference between the two bills.

7. If \$3.75 is taken out of \$5, how much remains?

NOTE. \$5 = 500 cents; 500¢ − 375¢ = 125¢ = \$1.25.

8. If you earn \$50 a week and spend \$37.50 each week, how much have you left at the end of each week?

9. From a bank deposit of \$1000 a man draws out \$856.30. How much remains in the bank?

10. John bought a fountain pen for \$1.75, paper for 44¢, mucilage for 12¢, and a blank book for 18¢. How much did they all cost? He gave in payment a \$5 bill. How much change should he receive?

Oral Exercise

149. 1. Repeat the table of linear measure, page 30.

2. How many feet are there in 11 yards? How many inches are there in 4 ft.? in 8 ft.? in 9 ft.?

3. 1 yard = —— inches.

4. 6 feet = —— yards.

5. 10 times 3 yd. = —— feet.

6. 2 feet = —— inches.

7. $\frac{1}{2}$ foot = —— inches.

8. $2\frac{1}{2}$ feet = —— inches.

9. $\frac{1}{3}$ foot = —— inches.

10. $3\frac{1}{3}$ ft. = —— inches.

11. $\frac{2}{3}$ ft. = —— inches.

12. $1\frac{2}{3}$ ft. = —— inches.

13. $\frac{3}{4}$ ft. = —— inches.

14. $3\frac{3}{4}$ ft. = —— inches.

15. 5 yards = —— feet.

16. 5 yd. + 1 ft. = —— feet.

17. 3 yd. + 12 in. = —— feet.

18. 24 inches = —— feet.

19. 30 inches = —— feet.

20. 40 inches = —— yards and —— inches.

21. 48 inches = —— yard and —— foot.

22. The distance around a square table top is 16 feet. How long is each side?

23. Each side of a triangle is 12 inches. How many feet is it around the triangle?

24. What is the distance around a 7-inch square?

25. How many feet of molding are there around the top of the room, if the room is 22 by 28 feet?

Measuring Exercise

150. Measure with the foot rule:

1. The distance from the floor to the lower edge of the blackboard.

2. The distance from the floor to the upper edge of the blackboard.

3. The width of the blackboard.

4. Add the width of the blackboard to the distance from the floor to the lower edge of the blackboard and see whether the sum is equal to the distance from the floor to the upper edge of the blackboard.

5. Measure the height and width of the door. How many feet and inches are there in the height? in the width?

Measure with the yard stick (marked off into inches):

6. The length of the room in yards and inches.

7. The width of the room in yards and inches.

8. Change the length to feet and inches.

9. Change the width to feet and inches.

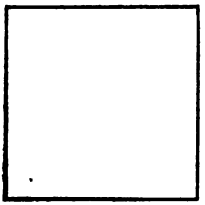
10. Measure with a foot rule and see whether your answers are correct.

11. See how far up you can reach and make a chalk mark on the board when standing on the floor. Each one try. Subtract this distance from the distance between the floor and the top of the blackboard, and see how far your mark is from the top.

12. Find the length and width of your playground.

13. What is its perimeter?

Oral Exercise



151. 1. What name is given to a figure that has 4 right angles and 4 equal sides? Draw such a figure.

2. What name is given to a figure that has 4 right angles, but is longer than it is wide? Draw such a figure.

3. What one name may be given to both of the above right-angled figures?

4. In what respect are these two figures alike? In what respect do they differ?

5. Describe a square foot as in Example 4, page 51.

6. Describe a square yard in yards; in feet.

7. Describe a square mile in miles.

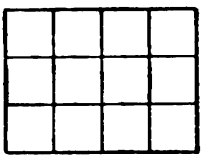
8. Describe a square that is 5 inches on a side.

9. Describe a rectangle that is 1 inch wide and 4 inches long. If the figure were twice as wide and twice as long, how many square inches would it contain?

10. Describe a rectangle that is 4 inches long and 2 inches wide. How many square inches would a figure twice as long and twice as wide contain?

Oral Exercise

152. 1. There are —— squares in the top row of the rectangle. There are —— squares in each row.



2. If each square were 1 square inch, there would be —— square inches in the surface of the rectangle.

153. **We call the size of any surface its area.**

3. In a rectangle 4 inches long and 1 inch wide there are —— square inches. In a rectangle 4 inches long and 3 inches wide there are 3×4 square inches = —— square inches.

4. What is the area of a rectangle 5 ft. long and 1 ft. wide? What is the area of a rectangle 5 ft. long and 2 ft. wide?

5. How do you find the area of a rectangle?

154. **To find the area of a rectangle, we multiply together the numbers of like units of its length and width.**

6. Find the area of a rectangle 4 in. by 8 in.

Give areas of the following rectangles:

7. 5 in. by 9 in.
8. 4 yd. by 11 yd.
9. 6 in. by 8 in.
10. 8 ft. by 7 ft.
11. 9 ft. by 8 ft.
12. 8 in. by 6 in.
13. 6 ft. by 9 ft.
14. 9 in. by 3 in.
15. 4 in. by 11 in.

Oral Exercise

Review Arts. 113 and 114, page 57

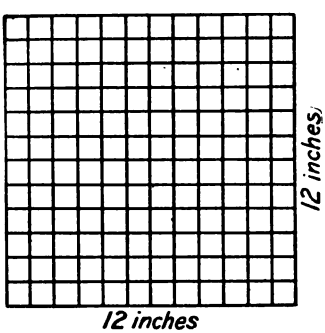
155. 1. Draw a figure to show the number of square feet in a square yard.

2. The distance around a figure is called the ——.

3. What is the perimeter of a 1-inch square? of a square 2 inches by 2 inches? of a square 3 feet by 3 feet?

4. Find the area of a flower bed 6 feet by 5 feet.

5. Find the area of a garden bed 30 feet by 5 feet.



6. If each edge of this square represents 1 foot, the whole square represents a ——.

7. There are —— rows of squares and —— squares in each row. If each square were 1 square inch, the whole square would contain —— square inches.

156.

144 square inches (sq. in.) = 1 square foot (sq. ft.).

8. Describe a square foot in feet; in inches.

Written Exercise

157. 1. How many square inches are there in $\frac{1}{2}$ of a square foot? in $\frac{1}{4}$ of a square foot? in $\frac{3}{4}$ of a square foot?

2. How many square feet are there in a floor 10 ft. wide by 12 ft. long?

Written Exercise

158. Illustrative Ex. (1) Find $\frac{1}{5}$ of 710; (2) $\frac{1}{7}$ of 5748.

WORK

(1) $5\overline{)710}\ 142$

(2) $7\overline{)5748}\ 821\frac{1}{7}$

EXPLANATION. (1) To get $\frac{1}{5}$ of a number, we divide by 5.

In getting $\frac{1}{5}$ of 710, we think $\frac{1}{5}$ of 7 hundreds is 1 hundred, with 2 hundreds undivided. We write 1 in the hundreds' place above the line. The 2 hundreds undivided with the 1 ten = 21 tens; $\frac{1}{5}$ of 21 tens is 4 tens, with 1 ten undivided. We write 4 in the tens' place above the line. The 1 ten undivided = 10 ones; $\frac{1}{5}$ of 10 ones is 2 ones. We write 2 in the ones' place above the line. *Ans.* 710.

In the same way we find $\frac{1}{7}$ of 5748 = $821\frac{1}{7}$.

Copy, perform, and prove the following:

	a	*b*	*c*	*d*	*e*	*f*
1.	$\frac{1}{2}$ of 78	$\frac{1}{2}$ of 56	$\frac{1}{2}$ of 34	$\frac{1}{3}$ of 51	$\frac{1}{3}$ of 48	$\frac{1}{3}$ of 177
2.	$\frac{1}{4}$ of 64	$\frac{1}{4}$ of 76	$\frac{1}{4}$ of 96	$\frac{1}{5}$ of 75	$\frac{1}{5}$ of 95	$\frac{1}{5}$ of 195
3.	$2\overline{)158}$	$3\overline{)204}$	$5\overline{)525}$	$6\overline{)588}$	$7\overline{)196}$	$8\overline{)272}$
4.	$5\overline{)545}$	$3\overline{)567}$	$9\overline{)405}$	$6\overline{)774}$	$7\overline{)273}$	$8\overline{)392}$
5.	$9\overline{)686}$	$2\overline{)548}$	$5\overline{)985}$	$2\overline{)816}$	$8\overline{)696}$	$6\overline{)474}$

Copy, divide, and prove the following:

	g	*h*	*i*	*j*	*k*
6.	$6\overline{)8616}$	$12\overline{)2448}$	$7\overline{)7351}$	$7\overline{)2618}$	$7\overline{)4816}$
7.	$8\overline{)9664}$	$11\overline{)7772}$	$11\overline{)8041}$	$7\overline{)1379}$	$8\overline{)5104}$
8.	$10\overline{)4780}$	$6\overline{)3654}$	$12\overline{)4276}$	$6\overline{)2634}$	$6\overline{)5922}$

Oral Exercise

159. 1. How many 10's are there in 20? in 200? in 40? in 400? in 50? in 500?

2. How many 10's, with what remainder, are there in 25? in 325? in 43? in 443? in 67? in 567?

160.

> **The division of a number by 10 may be expressed by cutting off the ones' figure. The figures at the left give the quotient, and the figures at the right give the remainder.**

3. How many 2's are there in 4? How many 20's in 40?
4. How many 3's are there in 6? How many 30's in 60?
5. How many 5's in 10? How many 50's in 100?
6. How many 5's in 45? How many 50's in 450?

Written Exercise

161. Illustrative Example. (1) Divide 380 by 20. (2) Divide 385 by 20.

WORK

(1) 19
$2|0\overline{)38|0}$

(2) 19 quotient
$2|0\overline{)38|5}$ remainder

EXPLANATION. (1) 20, or 2 tens, is contained in 38 tens 19 times. (2) 20, or 2 tens, is contained in 385 (ones) 19 times and 5 ones remain. *Ans.* 19 and 5 *remainder.*

162.

> **The division of a number by 2, 3, or more 10's may be expressed by cutting off the ones' figure from both divisor and dividend, and then dividing by 2, 3, 4, 5, etc.**

Written and Oral Exercise

163. Copy and divide:

	a	*b*		*c*	*d*
1.	80 by 10;	by 20	7.	\$4050 by \$50;	by \$30
2.	86 by 10;	by 20	8.	2643 by 20;	by 30
3.	720 by 10;	by 20	9.	8403 by 40;	by 60
4.	728 by 10;	by 30	10.	6240 by 30;	by 60
5.	212 by 10;	by 30	11.	6301 by 60;	by 70
6.	630 by 30;	by 70	12.	7563 by 40;	by 70

13. In 200 lb. there are how many 10 lb.? 20 lb.?

14. \$540 equals how many \$10? how many \$20?

15. In 1 ton of coal (2000 lb.) there are how many 20-lb. hodfuls? 40-lb. hodfuls?

16. How many \$20 chairs can be bought for \$660?

17. A book has 348 pages. How many pages are there in $\frac{1}{6}$ of it? in $\frac{1}{10}$ of it? in $\frac{1}{20}$ of it?

18. How far does an automobile go in 1 hour when it goes 189 miles in 9 hours? when it goes 189 miles in 10 hours? in 20 hours?

19. What is the cost of 1 house lot, \$3000 being the cost of 12? \$3000 being the cost of 30? of 40?

20. \$2786 was paid for a house and $\frac{1}{7}$ as much was paid for the lot. What was paid for the lot?

21. 4 casks contain 208 gallons of oil in equal quantities. How much does 1 cask contain?

Written Exercise

164. 1. Find the sum due on the following milk bill:

Bills due on the first Monday in each month.

WESTVILLE, MAINE, May 1, 1907.

MR. A. E. DODGE

To H. S. SIMMONS, DR.

To 60 quarts of milk from April 1 to date @ 6¢ per quart,

To 19 quarts of milk extra,

To 10 quarts of cream @ 40¢ per quart,

Rec'd payment,

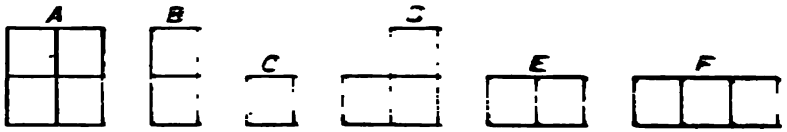
2. If 20 quarts of milk sell for 1 dollar, how many days will 1 dollar's worth of milk last a family that uses 3 quarts daily?

3. How much does it cost per week to feed a child that requires daily 2 quarts of milk worth 5 cents a quart, and $\frac{1}{2}$ pint of cream worth 20 cents a pint?

4. Which is more economical to buy, 3 quarts of milk daily at 5¢ a quart, if it will raise 1 pint of cream, or 1 pint of cream daily at the rate of 40 cents a quart? Explain the difference.

5. A milk bill for September amounted to $1.80. At 6 cents a quart, how many quarts were bought?

6. What is paid for 38 quarts of milk at 7 cents a quart, and 3 quarts of cream at 30 cents a pint?



Oral Exercise

165. 1. If A is 1, what is B? If A is 4, what is C?

2. If A is 8, what is B? what are $B + C$?

3. If B is 40, what is C? what is A? what is E?

4. If F is 6, what is E?

5. If C is 10, what is B? A? D? E? F?

6. If C is $\frac{1}{2}$, what is B? A? D? E? F?

7. If B is 2, what is the sum of A, B, C, D, E, and F?

8. If F is 40, what is D? $B+C$?

9. If A is 100, what is $\frac{1}{4}$ of A? what is B? C? D?

10. If C is 9, what is A? D? E?

11. If B is 14, what is A? F? what is C? D?

12. If D is 27, what is C? A? what is B?

13. If F is 45, what is C? E? A?

14. If C is worth 5 ¢, what are $A+B+D+E$ worth?

Written Exercise

166. Copy, divide, and prove the following:

	a	*b*	*c*	*d*
1.	$20\overline{)80}$	$30\overline{)600}$	$11\overline{)8384}$	$12\overline{)\$87.84}$
2.	$30\overline{)60}$	$40\overline{)800}$	$11\overline{)2695}$	$\frac{1}{6}$ of \$39.84
3.	$40\overline{)80}$	$60\overline{)1200}$	$12\overline{)\$54.00}$	$\frac{1}{7}$ of \$40.67

Written Exercise

167. Illustrative Ex. (1) Divide 876 by 12; (2) 987 by 21.

(1) SHORT DIVISION

$$\begin{array}{r} 73 \\ 12\overline{)876} \end{array}$$

(2) LONG DIVISION

$$\begin{array}{rl} 47 & \text{quotient} \\ \text{Divisor } 21\overline{)987} & \text{dividend} \\ \underline{84} & \text{product by 4 (tens)} \\ 147 & \\ \underline{147} & \text{product by 7 (ones)} \end{array}$$

(1) We know the products of 12; so we can divide 876 by 12 without writing down the work. The process is called **short division.**

(2) In dividing 987 by 21, we do not know the products of 21, but have to find them as we divide.

There are about as many 21's in 987 as there are 20's in 90, or 2's in 9. So we think 21 is contained in 98 (tens) 4 (tens) times. We write 4 in the tens' place in the quotient; 21 multiplied by 4 tens = 84 tens, 84 tens from 98 tens, leaves 14 tens.

14 tens and 7 ones = 147 ones. $147 \div 21 = 7$. We write 7 in the ones' place in the quotient. 21 multiplied by 7 = 147. 147 from 147 = 0. *Ans.* 47.

168. When the work in division is thus written down, the process is called **long division.**

NOTE. In the Illustrative Example above, when we said there are about as many 21's in 987 as there are 2's in 9, we made 2 our **trial divisor.** In dividing by any number of 10's, we make the 10's nearest our divisor our trial divisor. Thus, if we should divide 987 by 29, we should make 3 (tens) our trial divisor; if we should divide by 39, we should make 4 (tens) our trial divisor.

Written Exercise

169. Copy, and find the quotients:

	a	*b*	*c*	*d*
1.	$51\overline{)765}$	$32\overline{)544}$	$91\overline{)2002}$	$31\overline{)6386}$
2.	$71\overline{)994}$	$52\overline{)936}$	$81\overline{)1053}$	$65\overline{)2730}$
3.	$21\overline{)357}$	$63\overline{)945}$	$92\overline{)1012}$	$34\overline{)5780}$
4.	$31\overline{)589}$	$42\overline{)672}$	$82\overline{)1066}$	$72\overline{)7776}$
5.	$41\overline{)738}$	$33\overline{)891}$	$83\overline{)2241}$	$24\overline{)2976}$
6.	$61\overline{)976}$	$49\overline{)539}$	$44\overline{)3168}$	$62\overline{)1674}$
7.	$22\overline{)968}$	$32\overline{)874}$	$31\overline{)6510}$	$42\overline{)1050}$

8. How many months of 31 days each are there in 465 days?

9. How many hours will it take a steamer to cross the Atlantic, calling the distance 3000 miles, if it goes at the rate of 25 miles an hour?

10. If $2352 was paid for 42 head of cattle, what was the cost per head?

11. A house rents for $24 a month. For how many months will $576 pay?

12. There are 32 quarts in a bushel. In 800 quarts there are how many bushels?

13. A man pays a tax of $462 on 33 thousand dollars. What is the tax on 1 thousand dollars?

14. The curbstone of a sidewalk is 52 feet long. If its cost was $36.40, what was the cost per foot?

Written Exercise

170. Illustrative Example. Divide 1869 by 21.

WORK

$$21\overline{)1869}\quad 89$$
168
189
189

EXPLANATION. In dividing 1869 by 21, the 186 tens divided by the trial divisor, 2 tens, gives 9 (tens) for the quotient figure. But the product of 21 by 9 tens is 189 tens which is larger than 186 tens, the part of the dividend used. This shows that the quotient figure is too large. It should be 8 instead of 9. *Ans.* 89.

A product larger than the part of the dividend divided shows that a smaller quotient figure should be used.

171. By making a trial mentally, we can usually see whether the real divisor is contained just as many times as the trial divisor is, and so avoid doing our work over.

Copy and divide the following:

	a	*b*	*c*	*d*
1.	$21\overline{)609}$	$21\overline{)1869}$	$62\overline{)1850}$	$33\overline{)3267}$
2.	$23\overline{)1127}$	$83\overline{)4067}$	$83\overline{)3134}$	$32\overline{)3136}$
3.	$23\overline{)1081}$	$74\overline{)2170}$	$44\overline{)2552}$	$32\overline{)1888}$
4.	$44\overline{)2068}$	$34\overline{)7096}$	$54\overline{)2028}$	$33\overline{)2264}$
5.	$31\overline{)2139}$	$21\overline{)1420}$	$24\overline{)2136}$	$43\overline{)3341}$
6.	$41\overline{)3649}$	$62\overline{)925}$	$35\overline{)3395}$	$53\overline{)3657}$

7. 24 hours make 1 day. How many days are there in 1368 hours?

Written Exercise

172. Illustrative Example. Divide 667 by 29.

WORK

$$\begin{array}{r} 23 \\ 29\overline{)667} \\ 58 \\ \hline 87 \\ 87 \\ \hline \end{array}$$

EXPLANATION. In dividing 667 by 29, the 66 tens divided by the trial divisor 30 (3 tens) gives the true quotient figure, 2 (tens). But the remainder, 87 ones, divided by the trial divisor, 3 tens, gives 2 for a quotient figure with 29 remainder. This remainder shows that the quotient figure should be larger. It should be 3 instead of 2. *Ans.* 23.

A remainder equal to, or exceeding, the divisor, shows that a larger quotient figure should be used.

Copy and divide the following:

	a	*b*	*c*	*d*
1.	$36\overline{)828}$	$29\overline{)2494}$	$69\overline{)3105}$	$19\overline{)917}$
2.	$28\overline{)784}$	$49\overline{)4704}$	$79\overline{)6636}$	$19\overline{)1445}$
3.	$29\overline{)638}$	$59\overline{)3481}$	$59\overline{)1947}$	$38\overline{)3096}$
4.	$39\overline{)975}$	$37\overline{)9065}$	$28\overline{)2072}$	$48\overline{)3984}$
5.	$47\overline{)1081}$	$38\overline{)3496}$	$98\overline{)1862}$	$27\overline{)1134}$
6.	$39\overline{)1053}$	$69\overline{)6555}$	$19\overline{)1482}$	$89\overline{)45212}$

7. In a school of 648 pupils there are 18 teachers. How many pupils is this to a teacher?

Written Exercise

173. Copy and divide the following:

	a	*b*	*c*	*d*
1.	638 by 29	975 by 39	917 by 19	784 by 28
2.	1869 by 21	4067 by 83	1176 by 49	1947 by 59
3.	9027 by 37	9065 by 37	2543 by 74	2373 by 76
4.	5782 by 34	8685 by 35	2380 by 68	3306 by 58
5.	2170 by 74	2370 by 95	1862 by 98	3588 by 78
6.	1344 by 48	3096 by 38	7096 by 34	3680 by 38
7.	3496 by 38	6348 by 67	8120 by 83	812 by 96
8.	1089 by 18	2072 by 28	3984 by 48	1445 by 19
9.	812 by 29	2496 by 65	3422 by 86	5395 by 83
10.	2652 by 65	2943 by 87	1000 by 96	580 by 66
11.	3923 by 45	1068 by 52	9007 by 86	8370 by 77

12. How many minutes will it take a clock to tick 4740 times, if it makes 1 tick each second?

13. How many quarts are there in 1 bushel? How many bushel bags will hold 11,648 quarts of peanuts?

14. If one coat requires 28 buttons, how many coats will take 1512 buttons?

15. The cost of 18 horses was $4554. What was the cost of 1 horse?

16. How many days must a boy work to earn $13.50, if he earns $0.54 a day?

17. 14 chairs sold for $17.50. What was the price per chair? per dozen?

Oral Exercise

174. Repeat the table of square or surface measure.

SURFACE MEASURE
144 sq. in. = 1 sq. ft.
9 sq. ft. = 1 sq. yd.

Written Exercise

175. Illustrative Example. Change 1 sq. yd. to sq. in.

WORK

144
9
1296

SOLUTION. 1 sq. ft. = 144 sq. in. Therefore 1 sq. yd., or 9 sq. ft., = 9 × 144 sq. in. = 1296 sq. in.

Ans. 1296 sq. in.

1. Change 12 square feet to square inches.

2. Change 11 square yards to square feet.

3. Change 99 square feet to square inches.

4. The face of an envelope containing $\frac{1}{6}$ of a square foot contains how many square inches?

176. Illustrative Example. Change 1080 sq. ft. to sq. yd.

WORK

120
9)1080

SOLUTION. 9 sq. ft. = 1 sq. yd. 1080 sq. ft. = as many square yards as there are times 9 sq. ft. in 1080 sq. ft. $1080 \div 9 = 120$. *Ans.* 120 sq. yd.

5. Change 666 sq. ft. to square yards.

6. The floor of a band stand contains 25 square yards. It contains how many square feet?

7. 1860 square feet are equal to how many square yards and square feet?

Written Exercise

	6 ft.	6 ft.	6 ft.	6 ft.	6 ft.
5 ft.	Beets	Turnips	Sweet Peas	Cabbages	Asters

177. 1. Frank's garden is divided into five 6-ft. plots. The garden is —— feet long. $6 = \frac{1}{5}$ of ——.

2. Frank's garden expenses were as follows:

	$	Ct.
Paid for plowing and harrowing $.50	—	50
Paid for fertilizer, 60 lb. at 2 cents a pound	1	20
Paid for beet seed, 2 ounces at 8 cents an ounce	—	—
Paid for turnip seed, 4 ounces at 6 cents an ounce	—	—
Paid for cabbage plants, 3 dozen at 15 cents a dozen	—	—
Paid for aster plants, 4 dozen at 35 cents a dozen	—	—
Paid for sweet peas for seed, 3 ounces at 18 cents an ounce	—	—

Find his total expense for the garden.

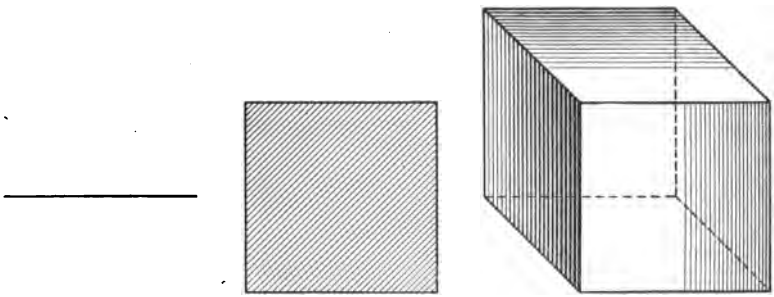
3. Frank's income from the garden was as follows:

	$	Ct.
Sold 3 pecks beet greens at 10 cents a peck	—	30
Sold 4 bunches sweet peas at 20 cents a bunch	—	80
Sold 1 bushel turnips at 50 cents a bushel	—	—
Sold 1 bushel beets at 40 cents	—	—
Sold 75 pounds cabbage at 2 cents a pound	—	—
Sold 6 bunches asters at 15 cents a bunch	—	—

Find his total income.

4. How much money did Frank gain or lose on his garden?

Oral Exercise



178. 1. A line has one dimension, **length.** A surface has two dimensions, —— and **width.** A solid body has three dimensions, ——, ——, and **thickness.**

179. Anything that has length, width, and thickness is a **solid.**

The teacher, presenting a 1-inch cubical body, asks:

2. How many squares has the surface of this body? These squares are called the **faces** of the solid.

3. Compare the faces of the solid in shape and size.

180. A solid having six equal square faces is called a **cube.**

4. How do the three dimensions of this cube compare?

181. A solid that is 1 inch long, 1 inch wide, and 1 inch thick is called a **cubic inch,** written cu. in.

5. How many faces has a cubic inch? What is the size and shape of each of its faces?

182. A cube 1 foot long, 1 foot wide, and 1 foot thick is called a **cubic foot,** written cu. ft.

Oral Exercise

183. Figure 1 represents a rectangular solid 3 inches long, 2 inches wide, and 1 inch thick.

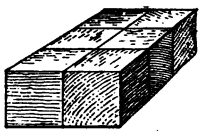


FIG. 1.

1. How many cubic inches are there in 1 row of the solid? How many cubic inches are there in the 2 rows?

2. Figure 2 represents a rectangular solid 3 inches long, 2 inches wide, and 2 inches thick. Find the number of cubic inches in this solid.

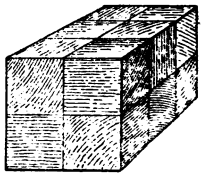


FIG. 2.

3. How many rows of cubic inches are there in 1 layer of this solid? How many cubic inches are there in the 2 layers?

4. Figure 3 represents a rectangular solid 3 inches long, 2 inches wide, and 3 inches thick. Find the number of cubic inches in this solid.

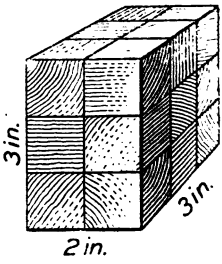


FIG. 3.

5. Prove your result by multiplying the number of 1-inch cubes in one row by the number of rows in one layer, and that product by the number of layers in the solid.

6. To find the contents of a rectangular solid, what numbers do you multiply together?

184. **To find the contents of a rectangular solid, we multiply together the numbers of like units of length, width, and thickness.**

Oral Exercise

185. 1. How many [illegible] many [illegible]

2. [illegible]

3. [illegible] faces of a [illegible]

4. [illegible] in a 2-[illegible]

5. A [illegible] wide, and 2 inches thick. [illegible]

Find the [illegible] following dimensions:

6. 5 in. long, 2 in. wide, 3 in. high.

7. 4 in. long, 3 in. wide, 2 in. high.

8. 3 ft. by 2 ft. by 1 ft.

9. 8 ft. by 2 ft. by 2 ft.

10. 7 ft. by 3 ft. by 2 ft.

11. 10 in. by 5 in. by 3 in.

Written Exercise

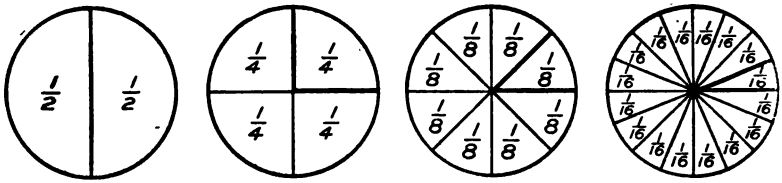
186. 1. How many 1-inch cubes can be put into a box measuring on the inside 12 in. by 12 in. by 12 in.?

2. How many cubic feet are there in a granite block 12 ft. by 5 ft. by 7 ft.?

3. How many cubic feet in a bin 9 ft. by 3 ft. by 6 ft.?

4. Find the capacity of a workbox measuring on the inside 6 in. in length, 5 in. in width, and 4 in. in depth.

5. Find the contents of a shoe box that is 11 inches long, 5 inches wide, and 4 inches high, inside measure.



Oral Exercise

187. 1. Into how many equal parts is the first circle divided? the second circle? the third circle? the fourth?

2. What is each part called in the first circle? in the second circle? in the third circle? in the fourth circle?

3. The first circle equals how many halves? fourths? eighths?

4. $\frac{1}{2}$ equals how many $\frac{1}{4}$'s? how many $\frac{1}{8}$'s? how many $\frac{1}{16}$'s? $\frac{3}{4}$ equals how many $\frac{1}{8}$'s? how many $\frac{1}{16}$'s?

188. One or more of the equal parts of a single thing is called a **fraction.**

Written Exercise

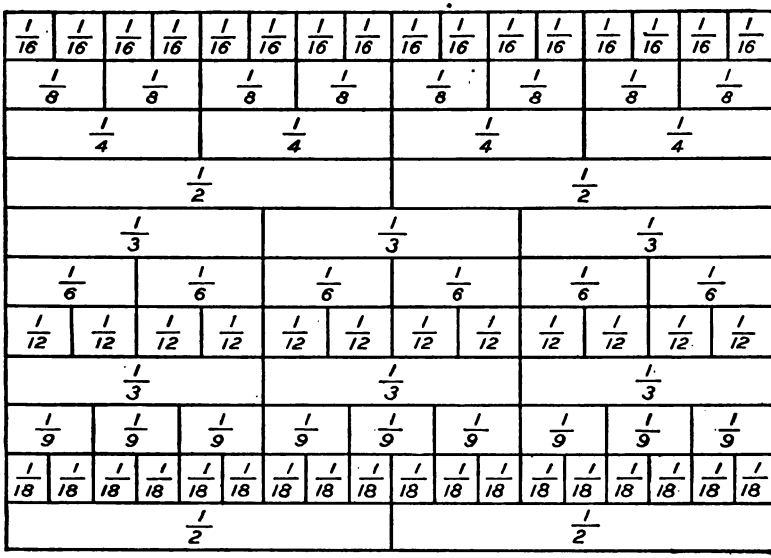
189. Adding and Subtracting Fractions.

Copy, and supply the missing numbers:

	a	*b*	*c*	*d*
1.	$\frac{1}{2}=\frac{\ }{4}$	$\frac{1}{4}=\frac{\ }{8}$	$\frac{1}{2}=\frac{\ }{8}$	$\frac{1}{2}=\frac{\ }{16}$
2.	$\frac{1}{8}=\frac{\ }{16}$	$\frac{2}{8}=\frac{\ }{16}$	$\frac{2}{16}=\frac{\ }{8}$	$\frac{4}{16}=\frac{\ }{4}$

	e	*f*	*g*
3.	$\frac{1}{2}+\frac{1}{2}=\frac{\ }{2}=1$	$\frac{1}{2}+\frac{2}{2}=\frac{\ }{2}=1\frac{1}{2}$	$\frac{1}{2}+\frac{1}{2}+\frac{1}{2}=\frac{\ }{2}=1\frac{\ }{2}$
4.	$\frac{1}{2}+\frac{1}{4}=\frac{\ }{4}$	$\frac{1}{2}+\frac{1}{4}+\frac{1}{4}=\frac{\ }{4}$	$\frac{2}{4}+\frac{1}{4}+\frac{1}{4}=\frac{\ }{4}=$—
5.	$\frac{1}{4}+\frac{1}{8}=$—	$\frac{1}{2}+\frac{2}{8}+\frac{2}{8}=\frac{\ }{8}$	$\frac{1}{8}+\frac{1}{16}+\frac{1}{16}=$—
6.	$2-\frac{1}{2}=$—	$2\frac{1}{2}-\frac{1}{4}=$—	$2\frac{1}{4}-\frac{1}{8}=$—

Scale to show Equivalents of Fractions



Oral Exercise

190. Using the scale, supply the missing numerators:

	a	*b*	*c*	*d*
1.	$\frac{1}{2} = \frac{\quad}{18}$	$\frac{1}{9} = \frac{\quad}{18}$	$\frac{1}{3} = \frac{\quad}{9}$	$\frac{1}{3} = \frac{\quad}{18}$
2.	$\frac{1}{3} = \frac{\quad}{12}$	$\frac{1}{6} = \frac{\quad}{12}$	$\frac{1}{2} = \frac{\quad}{4}$	$\frac{1}{4} = \frac{\quad}{8}$
3.	$\frac{1}{2} = \frac{\quad}{8}$	$\frac{1}{2} = \frac{\quad}{16}$	$\frac{1}{4} = \frac{\quad}{12}$	$\frac{1}{6} = \frac{\quad}{18}$
4.	$\frac{4}{16} = \frac{\quad}{4}$	$\frac{4}{16} = \frac{\quad}{12}$	$\frac{2}{8} = \frac{\quad}{4}$	$\frac{2}{8} = \frac{\quad}{12}$
5.	$\frac{4}{16} = \frac{\quad}{8}$	$\frac{4}{12} = \frac{\quad}{3}$	$\frac{4}{12} = \frac{\quad}{18}$	$\frac{4}{12} = \frac{\quad}{9}$
6.	$\frac{1}{3} + \frac{\quad}{3} = 1$	$1 = \frac{\quad}{3}$	$1 = \frac{\quad}{6}$	$\frac{5}{6} - \frac{1}{6} = —$
7.	$\frac{8}{9} - \frac{\quad}{9} = \frac{5}{9}$	$1\frac{1}{4} + \frac{3}{8} = —$	$1\frac{1}{9} - \frac{1}{18} = —$	$3\frac{1}{4} - \frac{1}{12} = —$

Oral Exercise

191. 1. Your 1-foot ruler is how many inches long? How many inches are there in $\frac{1}{3}$ of it? in $\frac{2}{3}$ of it?

2. In anything there are how many $\frac{1}{3}$'s? $\frac{1}{4}$'s? $\frac{1}{5}$'s? $\frac{1}{9}$'s? $\frac{1}{12}$'s? $\frac{1}{20}$'s?

3. What is $\frac{1}{3}$ of 9? of 18? $\frac{2}{3}$ of 9? $\frac{2}{3}$ of 18?

4. Give $\frac{1}{3}$ and $\frac{2}{3}$ of each of the following numbers:

15 3 9 27 30 24 12 6 33 36 21

5. Give $\frac{1}{4}$ and $\frac{3}{4}$ of each of the following numbers:

48 12 16 4 28 36 40 32 44 80 24

6. Give $\frac{1}{5}$ and $\frac{3}{5}$ of each of the following numbers:

15 25 10 30 5 35 20 40 55 50 60

7. Give $\frac{1}{6}$ and $\frac{5}{6}$ of each of the following numbers:

12 6 18 30 24 36 42 48 54 60 66

Take a strip of paper 1 inch wide and 6 inches long, and show by folding it that:

	a	*b*	*c*	*d*
8.	$\frac{2}{4}=\frac{1}{2}$	$\frac{1}{3}=\frac{2}{6}$	$\frac{3}{4}=\frac{6}{8}$	$\frac{6}{12}=\frac{1}{2}$
9.	$\frac{6}{12}=\frac{2}{4}$	$\frac{5}{6}=\frac{10}{12}$	$\frac{3}{6}=\frac{1}{2}$	$\frac{2}{4}=\frac{3}{6}$

Take another strip 1 inch wide and 10 inches long, mark it off in inches, and then show by folding or counting that

10. $\frac{1}{5}=\frac{2}{10}$ $\frac{1}{2}=\frac{5}{10}$ $\frac{3}{5}=\frac{}{10}$ $\frac{4}{5}=\frac{}{10}$ $\frac{2}{5}=\frac{}{10}$ $\frac{5}{5}=\frac{}{10}$

11. Mary's school keeps 25 hours a week. Frank's keeps $\frac{4}{5}$ as many hours. How many does Frank's keep?

12. At 24 cents a pound for cheese, what is the cost of $\frac{3}{4}$ lb.? of $\frac{5}{8}$ lb.?

Oral Exercise

Review pages 77 and 78.

192. How many months are there in:

	a	*b*	*c*	*d*	*e*
1.	$\frac{1}{2}$ year?	$\frac{1}{3}$ year?	$\frac{2}{3}$ year?	$\frac{1}{4}$ year?	$\frac{3}{4}$ year?
2.	$\frac{1}{6}$ year?	$\frac{5}{6}$ year?	$\frac{1}{12}$ year?	$\frac{5}{12}$ year?	$\frac{7}{12}$ year?

How many hours are there in:

	f	*g*	*h*	*i*	*j*
3.	$\frac{1}{3}$ day?	$\frac{2}{3}$ day?	$\frac{3}{4}$ day?	$\frac{1}{6}$ day?	$\frac{5}{6}$ day?
4.	$\frac{1}{8}$ day?	$\frac{3}{8}$ day?	$\frac{5}{8}$ day?	$\frac{1}{12}$ day?	$\frac{7}{8}$ day?

5. How many minutes are there in 1 hour? in $\frac{1}{3}$ hour? in $\frac{2}{3}$ hour? in $\frac{1}{4}$ hour? in $\frac{3}{4}$ hour?

How many days are there in:

6. $\frac{1}{3}$ of June? in $\frac{2}{3}$? in $\frac{1}{5}$? in $\frac{3}{5}$? in $\frac{4}{5}$? in $\frac{1}{6}$?
7. $\frac{5}{6}$ of June? in $\frac{1}{10}$? in $\frac{3}{10}$? in $\frac{7}{10}$? in $\frac{9}{10}$? in $\frac{1}{2}$?
8. $\frac{1}{4}$ of February? in $\frac{3}{4}$? in $\frac{1}{7}$? in $\frac{3}{7}$? in $\frac{5}{7}$? in $\frac{1}{2}$?
9. What is $\frac{1}{5}$ of 50? $\frac{2}{5}$? $\frac{3}{5}$? $\frac{4}{5}$? $\frac{1}{6}$ of 60? $\frac{5}{6}$ of 60?

Written Exercise

193. Illustrative Example. What is $\frac{2}{3}$ of 642?

WORK

$214 \times 2 = 428$

$3\overline{)642}$

EXPLANATION. To find $\frac{1}{3}$ of 642 we divide by 3. $\frac{1}{3}$ of $642 = 214$. $\frac{2}{3}$ of $642 = 2$ times $214 = 428$. *Ans.* 428.

Find:

1. $\frac{3}{4}$ of 1640
2. $\frac{4}{5}$ of 1375
3. $\frac{5}{6}$ of 1542
4. $\frac{6}{7}$ of \$ 5.95
5. $\frac{3}{10}$ of 4009
6. $\frac{19}{9}$ of \$ 7.74
7. $\frac{5}{16}$ and $\frac{1}{2}$ of \$ 870
8. $\frac{7}{10}$ and $\frac{3}{5}$ of \$ 1280
9. $\frac{4}{6}$ and $\frac{2}{3}$ of \$ 6.42

Oral Exercise

194. 1. When $\frac{1}{4}$ of a melon and $\frac{1}{8}$ of a melon have been eaten, what part of the melon remains?

2. Willie lives $\frac{1}{4}$ of a mile from his school. Ira lives twice as far. What part of a mile does Ira live from school?

3. Charles spent $\frac{1}{2}$ dollar and $\frac{1}{4}$ dollar, and then had 25 cents left. How much had he at first?

4. The side of a square is $1\frac{1}{4}$ feet. How many feet is it around the square? how many inches?

5. The noon recess at school is 1 hour. Bert takes $\frac{5}{6}$ of this time to go home and return. How many minutes does he take?

6. A triangle of equal sides measures 27 inches around. What is the length of two sides?

Written Exercise

195. 1. Roger counted 140 roses in his garden. $\frac{3}{10}$ of these he took to market. How many did he take?

2. The First Book in Arithmetic contains 168 pages. Part I is $\frac{2}{6}$ of the whole. How many pages has Part I?

3. Hall's father is $\frac{3}{7}$ as old as Hall's grandfather, who is 91 years old. How old is Hall's father?

4. Dana's house is $\frac{3}{4}$ of a mile from school. A mile is 5280 feet. How many feet is his house from school?

5. A man divided 485 acres equally among his 5 children, — 2 sons and 3 daughters. How many acres did the sons have? How many did the daughters have?

Oral Exercise

196.

1. 1 pound = —— ounces.
2. 1 ton = —— pounds.
3. $\frac{1}{2}$ pound = —— ounces.
4. $\frac{1}{4}$ pound = —— ounces.

WEIGHT
16 ounces (oz.) = 1 pound (lb.).
100 pounds = 1 hundredweight (cwt.).
20 hundredweight = 2000 pounds = 1 ton (T.).

5. Memorize and repeat the table above.
6. 2 pounds = —— oz.
7. $2\frac{1}{2}$ pounds = —— oz.
8. $1\frac{1}{4}$ pounds = —— oz.
9. 12 oz. = $\frac{1}{4}$ of lb.
10. 4 oz. = —— of lb.
11. 8 oz. = —— of lb.

12. An 8-ounce weight is what part of 1 pound? of 2 pounds? of 4 pounds?

13. A 4-ounce weight is what part of 1 pound? of 2 pounds? of 4 pounds?

14. How many pounds are there in 1 ton? in 2 tons? in $\frac{1}{2}$ ton? in $1\frac{1}{2}$ tons?

15. 1 hundredweight = what part of 200 pounds? of 300 pounds? of 500 pounds?

16. How many pounds are there in $\frac{1}{4}$ hundredweight? in $\frac{3}{4}$ hundredweight?

17. Change $\frac{1}{2}$ ton to pounds; to hundredweight.

18. Change $\frac{3}{4}$ ton to pounds; to hundredweight.

19. How many tons of coal are there in a load which weighs 3000 pounds?

20. How many 5-pound baskets of grapes will weigh 1 hundredweight?

Oral Exercise

197. 1. How many quarter-pound packages of pepper can be made from 3 pounds? from 12 ounces? from 20 ounces?

2. How many half-pounds are there in 24 ounces? in 32 ounces? in 40 ounces?

3. Six 8-ounce weights = how many pounds? How many $\frac{1}{2}$ lb.? $\frac{1}{4}$ lb.?

4. A 10-pound package of nails costs 50 cents. They cost —— cents a pound.

5. James sells $8\frac{1}{2}$ lb. of old rubber at 4 cents a pound. How much does he get for it?

6. 3 ounces of sunflower seed at 32¢ a pound cost ——¢.

7. 5 ounces of nasturtium seed at 48¢ a pound cost ——¢.

8. At 2¢ for 4 oz. of loaf sugar, how much are $1\frac{1}{4}$ lb. worth?

9. $\frac{1}{8}$ lb. + $\frac{1}{4}$ lb. + $\frac{1}{2}$ lb. = what part of a pound?

10. At $1\frac{1}{2}$ cents a pound 20 pounds of old iron sell for —— cents.

Written Exercise

198. 1. The weight of two carts is 2100 pounds. If one weighs 1159 pounds, how much does the other weigh?

2. $\frac{1}{4}$ ton of hay sells for $3.68. What is the price per ton? per hundredweight?

3. How many hundredweight of wheat are there in 10 bushels of 60 pounds each?

4. How many bushels are there in 2340 pounds of wheat?

Written Exercise

199. 1. By measuring find the length and width of the longest blackboard in your room, and find its area.

2. The area of the shortest piece of blackboard in the room is —— square feet.

3. Find the dimensions in feet and the area in square feet of the floor of the schoolroom.

4. Give the area of 1 side of the room in square yards.

5. Take other measurements and make other problems.

6. If 1 manual training bench costs $9.50, how much will it cost to equip a workroom with 25 such benches?

7. James is making a box kite. The frame is to be made of strips of spruce. He will need 4 side pieces each 24 inches long, 8 end pieces each 18 inches long, and 4 cross braces each $21\frac{3}{5}$ inches long. How many feet in length will he need for the whole frame?

8. Tell, if you can, the number of square feet there are on the 4 sides of the kite.

9. The bottom of a rectangular box measures 5 feet 2 inches long and 2 feet 2 inches wide. How many square inches are there in its surface?

10. The above box is 12 inches deep inside and is made of boards 1 inch thick. What are the inside dimensions of the box in feet? How many cubic feet will the box contain?

11. How many cubic inches are there in the above box?

Oral Exercise

LIQUID MEASURE
4 gills = 1 pint.
2 pints, 8 gills = 1 quart.
4 quarts = 1 gallon.

200. 1. Repeat the table of liquid measure.

2. Change 5 quarts to gills; 12 quarts to gills.

3. Change 6 gallons to pints; 10 gallons to pints.

4. Change 11 pints to gills; 16 pints to quarts.

5. Change 36 quarts to gallons; 16 pints to gallons.

6. Pickled limes at 24¢ a qt. are how much a pint?

7. If 1 quart of water weighs 2 lb., what is the weight of 1 gallon? 4 gallons? of 7 gallons? of 9 gallons?

8. If a family uses 20 quarts of milk per week, how many gallons does it use in 12 weeks?

9. Find the cost of 3 qt. of ice cream at $1.20 a gal.

Written Exercise

201. 1. In two casks of oil there are 63 gal. One cask contains $45\frac{1}{2}$ gal. How much does the other contain?

2. At 45 cents a quart for ice cream, what is the cost of 6 gallons? of 8 gallons?

Find the cost:

3. Of 1 quart of alcohol at $2.50 a gallon; of 2 qt.

4. Of 12 gallons of vinegar at $8\frac{1}{3}$ cents a gallon.

5. Of 4 gallons of turpentine at 46 cents a quart.

6. A faucet delivers 360 gallons of water an hour. How much is this a minute?

Oral Exercise

202. 1. One quart equals what part of a peck? of a bushel?

2. One pint equals what part of a quart? of a peck?

DRY MEASURE
2 pints = 1 quart.
8 quarts = 1 peck.
4 pecks, 32 quarts = 1 bushel.

3. How much will 2 pecks of oats cost at 40 cents a bushel?

4. How many pecks are there in 16 qt.? in 24 qt.?

5. What is the cost of 7 pints of beans at 8¢ a qt.?

6. How many pecks are there in $\frac{1}{2}$ bushel? in $\frac{3}{4}$ bushel? in $2\frac{1}{2}$ bushels?

7. How much do I receive for $3\frac{1}{2}$ bushels of apples at 30 cents a peck?

8. What is the cost of $\frac{1}{2}$ peck of cherries at $2 per bu.?

9. How many 2-quart boxes can be filled from 2 bushels of currants?

10. If a peck of corn costs 25 cents, how much will $2\frac{1}{2}$ bushels cost?

11. If spinach costs 10¢ a pk., what is the cost of a bushel?

12. How many bushel boxes can be filled with 18 pecks of tomatoes?

13. From a barrel containing 2 bushels of pea beans, 16 quarts are taken. How many bushels remain?

14. How many bushel boxes will be required to hold 48 pecks of beets? to hold 38 pecks?

Written Exercise

203. 1. $1\frac{1}{2}$ pecks of peas are how many quarts?

2. How many bushel boxes will hold 128 pecks of pears?

3. Change $2\frac{1}{2}$ bushels to pecks; $12\frac{1}{2}$ bushels to pecks; $18\frac{3}{4}$ bushels to pecks.

4. A woman can shell a peck of beans in 20 minutes. How long would it take her to shell $2\frac{1}{2}$ bushels?

What is the cost:

5. Of $\frac{1}{2}$ bushel of currants at 9 cents a quart?

6. Of $3\frac{1}{2}$ pecks of plums at 8 cents a quart?

7. Of 2 bushels 3 pecks of beans at 40 cents a peck?

8. A bin contains 80 bushels of barley. 18 pecks are taken out. How many bushels remain?

9. $80 - 4\frac{1}{2} = ?$ $80 - 14\frac{1}{2} = ?$ $80 - 10\frac{1}{2} = ?$ $80 - 25\frac{1}{2} = ?$

10. A barrel contains 2 bushels of corn. 16 quarts are taken out. How many quarts remain?

11. $64 - 16 = ?$ $64 - 19 = ?$ $64 - 25 = ?$ $64 - 37 = ?$

12. How many quarts of cranberries will fill 8 barrels of 2 bushels each?

13. If 2 bu. rye cost $\$1.60$, find the cost of 1 peck.

14. A bushel of oats weighs 32 pounds; a bushel of corn weighs 56 pounds. How many bushels of corn equal in weight 7 bushels of oats?

15. A rectangular tank is 11 inches square at the bottom and 21 inches deep. How many gallons of 231 cu. in. will it hold?

204. Examine the following price list of a city grocer:

Bread, per loaf	5 cents	Salt, per bag	10 cents
Coffee, per lb.	40 cents	Shredded wheat, per pkg.	12 cents
Butter, per lb.	36 cents	Soap, per bar	5 cents
Crackers, per lb.	10 cents	Strawberries, per box	15 cents
Eggs, per doz.	40 cents	Sugar, 6 lb. for	25 cents
Lard, per lb.	8 cents	Sugar (loaf), per lb.	7 cents
Molasses, per gal.	60 cents	Tea, per lb.	70 cents
Potatoes, per bu.	72 cents	Yeast, per cake	2 cents

Written Exercise

205. Copy and find the sum of each of the following orders according to the above price list:

1. $2\frac{1}{2}$ lb. crackers, 4 bars soap, 1 bag salt, 4 pkg. shredded wheat.

2. 6 lb. sugar, 5 lb. coffee, 3 bars soap, 1 pk. potatoes, $20\frac{1}{2}$ lb. lard.

3. 5 bars soap, 3 lb. crackers, $1\frac{1}{4}$ lb. butter, 3 lb. tea.

4. 1 bag salt, 3 bars soap, 3 lb. coffee, 1 yeast cake.

5. 4 yeast cakes, 8 lb. loaf sugar, 4 doz. eggs, $\frac{1}{2}$ lb. tea.

6. 6 lb. lard, $\frac{3}{4}$ lb. coffee, 4 lb. crackers, 1 gal. molasses.

7. 3 lb. lard, $\frac{1}{2}$ bu. potatoes, 12 lb. sugar, 1 bag of salt.

8. 2 lb. butter, 6 lb. coffee, 2 loaves bread, $4\frac{1}{2}$ lb. lard.

9. 2 boxes strawberries, 1 gal. molasses, $\frac{3}{4}$ doz. eggs.

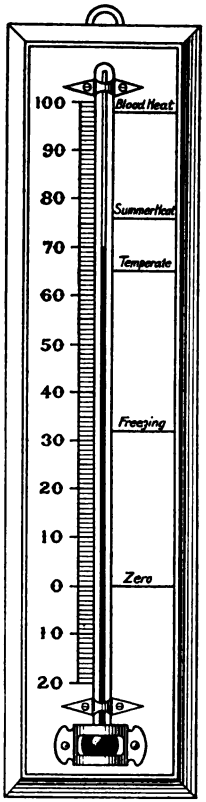
10. $1\frac{1}{2}$ doz. eggs, 2 lb. coffee, 5 lb. crackers, 2 bags salt.

11. 2 pkg. shredded wheat, 1 qt. molasses, $2\frac{3}{4}$ lb. butter.

NOTE. The pupil should make price lists, and make and solve problems, applying the prices.

Oral Exercise

206. 1. For what is the thermometer used?



2. When the air is very warm, does the liquid in the glass tube stand high or low?

3. What does the liquid in the tube do as the air grows colder?

4. From what figure on the thermometer scale do the numbers increase upward and downward?

207. The divisions marked off on the scale are called **degrees.** 10 degrees above zero means 10 degrees warmer than zero weather. 10 degrees below zero means 10 degrees colder than zero weather.

208. The sign ° stands for degrees. Ten degrees is written 10°.

5. At how many degrees above zero (0) does the liquid stand in the picture?

6. At how many degrees above 0 is the freezing point marked?

7. At how many degrees above 0 is the temperate point marked? At what point is blood heat marked?

NOTE. The word *thermometer* means heat measure.

Oral and Written Exercise

209. 1. How many degrees are there between 0 and freezing? between 10° below 0 and freezing?

2. How many degrees are there between 0 and temperate? between freezing and temperate?

3. How many degrees are there between temperate and blood heat? between freezing and blood heat?

4. If the temperature was 8° above 0 at 7 o'clock in the morning and rose to 32° above at 11 o'clock, what was the difference in hours and in degrees?

5. If the temperature rises 24° in 4 hours, what is the average rise per hour?

6. If the temperature of the schoolroom is 62° above 0 at the floor and 73° above 0 at the top of the room, how much difference is there?

7. Water boils at 212° above 0. How high is this above the freezing point?

8. What is the change in temperature from 19° above 0 to 7° below? from 6° below 0 to 20° below?

9. At 7 A.M., January 23, the thermometer showed a temperature of 8° above 0. At the same hour on January 24, the temperature was 16° lower. What was the temperature on January 24 at 7 A.M.?

10. If the lowest temperature on February 12 was 6° below 0 and the highest temperature was 38° above 0, what was the difference in temperature for the day?

Oral Exercise

210. 1. How much milk at 7 cents a quart can be bought for 28 cents? for 49 cents? for 56 cents? for 84 cents?

2. If eggs sell at 5 dozen for $1, what is the price per dozen?

3. A boy spends 10 cents for papers at 2 cents each. He sells them for 4 cents each. How much does he gain on the lot?

4. If a boy makes $\frac{1}{2}$ cent by selling 1 paper, how many must he sell to make 5¢? to make 40¢?

5. Dick made 50¢ by buying papers at 2¢ apiece and selling them at 3¢. How many did he sell?

6. Carl sells 5¢ papers on which he makes 2¢ each. How many must he sell to make $1?

7. Which is more profitable to sell, 10 papers at a profit of 2¢ each, or 25 at a profit of 1¢ each?

8. How many dozen eggs are there in a lot of 72 eggs? of 96 eggs? of 108 eggs?

9. In 8 months a boy gained 25 pounds in weight. What was the average gain in pounds and ounces per month?

10. How many cubic inches are there in a block of chalk 4 inches long, 3 inches wide, and 3 inches thick?

11. A clock loses $1\frac{1}{2}$ minutes a day. If it tells the correct time on Monday, how much too slow will it be at the end of 1 week?

Written Exercise

211. 1. If the price of cream is 35 cents a quart, for how much do 39 quarts sell?

2. What is the profit from a cow that produces $115 a year, if her keeping costs $56?

3. I buy a horse for $125 and sell it for $160. What is the profit?

4. I buy a cow for $45 and sell it for $\frac{1}{5}$ less than I pay. For how much do I sell it?

5. A fresh cheese weighs 60 pounds. Later it is found to have shrunk $\frac{1}{4}$. What is its loss in weight?

6. A firkin of butter weighs 47 pounds. It sells at 38 cents a pound. For how much does it sell?

7. What is the selling price of a cheese weighing 46 pounds at 17 cents a pound?

8. A book of 348 pages is in 6 chapters. What is the average number of pages to a chapter?

9. A house worth $2275 is insured for $\frac{3}{5}$ of its value. For how much is the house insured?

10. How many gallons of oysters at $1.25 per gallon can be bought for $10?

11. From a cask containing 44 gallons of linseed oil $16\frac{1}{4}$ gallons are drawn. How many gallons remain?

12. A lot of corn was sold at 25 cents a peck. It brought $12.50. How many bushels were there?

13. Estimate in cubic feet the capacity of a box 22 inches by 58 inches by 12 inches, inside measure.

PART II

READING AND WRITING NUMBERS

Review carefully pages 7 to 11.

Oral and Written Exercise

212. Read the following numbers:

	a	*b*	*c*	*d*
1.	4576	6560	2,478	32,422
2.	9099	5055	7,800	57,124
3.	165	3465	479	11,396
4.	505	8008	5,555	111,639
5.	9789	1201	10,236	156,746
6.	9909	5005	15,651	734,698

Write in figures:

7. Four thousand seven hundred sixty-one.
8. Nine thousand nine hundred nine.
9. Nine thousand nine hundred ninety-eight.
10. Nine hundred thousand ninety-nine.
11. Six hundred nine thousand six hundred fifty.
12. Three thousand three hundred forty-six.
13. Eight hundred eighty thousand forty-eight.
14. Two thousand nine hundred eighty-seven.
15. Three hundred ninety thousand one hundred four.

Oral and Written Exercise

213. 1. Ten ones make one ——. Ten tens make one ——. Ten hundreds make one ——. Ten thousands make one ——. Ten ten thousands make one ——. Ten hundred thousands make *one million*.

We write one million thus: 1,000,000. Two million is written thus: 2,000,000.

Read the following:

	a	*b*	*c*	*d*
2.	5,000,000	3,430,200	91,396,879	319,216,144
3.	6,500,000	4,763,158	475,574,547	56,055,247
4.	8,650,000	1,124,723	134,437,869	929,540,705

Write in figures:

5. Three million, one hundred forty-one thousand, six.
6. Seventy million, three hundred six thousand, fifty.
7. Eleven million, seven hundred thousand.
8. Twenty million, seven hundred fifty thousand.
9. Nine hundred million, seven hundred sixty.

10. Read the following: 685,112,472. In this example what number is expressed by the second group from the right? by the third group?

The group next higher than millions is called **billions**. 1 billion is written 1,000,000,000; 2 billion is written 2,000,000,000.

11. Read the following:

a 1,576,457,311 *b* 50,897,643,201.

Written Exercise

Review pages 13 to 18.

214. Add the following:

1.	2.	3.	4.	5.	6.
$ 32	$1.87	$2.37	$3.15	$75.31	$18.19
108	.98	1.63	.96	9.64	36.21
39	.34	9.08	8.69	54.98	56.27

7. Find the amount of this bill for fuel:

SPRINGFIELD, MASS., Sept. 22, 1901.

L. H. PAGE & Co., COAL AND WOOD.

Sold to J. B. TAYLOR,

2000 lb. Stove Coal	$7	50
2000 lb. Furnace Coal	6	75
1 cord hard & soft Wood	6	50

8. Find the cost of 1 mirror $5.90, 1 rug $16.67, 1 lounge $44.00, 1 rocker $15.50, 1 bureau $13.50, and 1 desk $17.63.

Add the following:

9.	10.	11.	12.	13.
$543	$8.65	$5.71	$9.08	$16.35
75	3.00	4.35	9.19	54.89
829	14.09	14.25	3.05	31.42
615	76.50	9.15	41.02	61.17
320	34.21	81.02	21.85	1.82
171	22.08	17.14	13.62	5.89

Written Exercise

215. Copy and add the following:

1. $6234 + 785 + 9889 + 5861 + 198.$
2. $582 + 42 + 9 + 124 + 2850 + 4092.$
3. $2356 + 8004 + 987 + 6445 + 574.$
4. $7329 + 8288 + 658 + 6409 + 8492.$
5. $70{,}639 + 600 + 7000 + 9428 + 800.$
6. $76 + 33 + 92 + 53 + 305 + 78 + 8 + 19.$

The following table shows the average number of pupils belonging to each grade of the schools of a city for the years given. Find the total number for each year.

Grades	1899	1900	1901	1902	1903	1904	1905	1906
	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Kindergarten	238	227	237	249	255	260	242	195
I	413	126	517	457	496	434	437	433
II	332	—	380	422	408	403	378	363
III	317	350	351	351	366	410	401	354
IV	329	332	354	367	311	382	359	390
V	256	286	305	355	318	313	371	347
VI	209	209	238	286	260	300	283	307
VII	139	176	168	189	168	194	230	232
VIII	113	126	172	171	163	162	174	189
IX	116	99	128	152	139	165	155	167
X High sch.	69	78	87	96	127	127	126	112
XI	48	50	53	63	56	81	85	79
XII	32	35	37	31	33	41	50	49
XIII	20	24	26	30	24	24	31	46
Totals								

Written Exercise

Review carefully pages 20 to 24.

216. Subtract the following:

	a	*b*	*c*	*d*	*e*
1.	\$2.62	\$21.40	\$32.62	\$42.34	\$73.85
	−1.25	−15.36	−26.16	−34.05	−65.16
2.	\$80.91	\$37.44	\$45.60	\$32.05	\$40.82
	−23.44	−29.38	−27.34	−17.54	−34.15

3. Mr. Reed bought a horse for \$279 and sold it for \$350. How much did he gain?

4. Frances had \$10.95; she bought with part of it a coat for \$6.87. How much money did she have left?

5. A house and barn are worth \$9900; the barn is worth \$856. How much is the house worth?

6. If you earn \$17.45 and spend \$9.88 for clothes, how much money do you have left?

7. Mary has \$32.61, Charlotte has \$8.29 more than Mary. How much money have both?

8. A man borrowed \$3850 and paid at one time \$640, at another time \$850. How much did he then owe?

9. The balance due on a depositor's bank book the 1st of May was \$84.40; May 15, he drew out \$16.85, and May 20, he deposited \$73.68. What was the balance then remaining in the bank?

Written Exercise

217. Find the remainders in the following:

	a	*b*	*c*
1.	8491 − 2786	3212 − 2913	8642 − 3700
2.	3089 − 2435	1698 − 472	3291 − 1232
3.	5983 − 4032	2974 − 1368	8367 − 7420
4.	7751 − 3366	4353 − 2544	6787 − 6735
5.	8104 − 5101	5987 − 4856	5055 − 5432

6. How old is a person who was born in 1876?

7. The following table shows the number of pupils in the first 7 grades of the schools of a city, 1905 and 1906. Find the loss or gain in each grade and in all grades in 1906.

	d	*e*	*f*	*g*	*h*	*i*	*j*
GRADES	KINDER-GARTEN	I	II	III	IV	V	VI
1906	735	7750	5883	5673	5383	4900	4246
1905	699	6783	5649	5510	5595	4164	3809

8. The estimated population of London in 1904 was 6,806,296, of New York 3,437,202. How much larger was the population of London?

9. The distance from Boston to Glasgow is 2785 miles. From Boston to Liverpool it is 2932 miles. How much greater is the distance from Boston to Liverpool?

10. In 1905 there were 1102 vessels of all kinds built in the United States. In 1906 the number was 1221. What was the increase?

Oral Exercise

218. 1. One dozen files costing $1.00 are sold at 12 cents apiece. What is the profit on a dozen?

2. A box of soap of 100 cakes cost James $5.50. He sold it by the cake for $8.25. How much did he gain?

3. A gold bracelet and bangle cost $33.00. The cost of the bangle was $13.50. What was the cost of the bracelet?

4. Magazine subscriptions cost as follows: *Outing* $3.00, *Ainslie's* $1.80, *The World To-day* $1.50. What is the cost of the three? How much can be saved by taking the three at a cost of $3.50?

Written Exercise

219. Add the following:

1. 154,161 + 163,192 + 232,235 + 273,308 + 328,211.

2. 803,222 + 20,816 + 7,144 + 102,093 + 6,516.

3. 81,085 + 119,151 + 76,104 + 20,152 + 112,823.

Subtract:

4. 65,817 − 37,941 278,711 − 11,987 72,194 − 4,013

5. 5,101 − 3,144 8,118 − 4,191 2,017 − 1,640

6. The following figures show the savings bank business for the United States in the years 1895 and 1905.

Find the increase in each item, *a*, *b*, *c*, and *d*:

	a	*b*	*c*	*d*
Year	Number of Savings Banks	Deposits	Depositors	Average Deposits
1905	1237	$3,261,236,119	7,696,229	$423.74
1895	980	1,844,367,798	4,875,519	378.31

Written Exercise

Review pages 26, 28, and 67.

220. Illustrative Example. 1 mile equals 320 rods. How many rods are there (1) in 100 miles? (2) in 200 miles?

Work	Solution and Explanation.
(1) 320	(1) Since 1 mile = 320 rods, 100 miles = 100 times
100	320 rods, which is expressed by annexing
32000	two 0's to 320, thus 32,000. *Ans.* 32,000.
(2) 320	(2) 1 mile = 320 rods; 200 miles = 200
200	times 320 rods, = 64,000 rods.
64000	*Ans.* 64,000 rods.

In practice we multiply by a number of 100's *as we multiply by* 1's *and annex to the product two* 0's.

1. There are 640 acres in 1 square mile. How many acres are there in 500 square miles?

2. A mile equals 5280 ft. 700 miles equal how many ft.?

3. What is the cost of 300 sq. ft. of land at $4.20 a sq. ft.? the cost of 900 sq. ft. at $18.75 a sq. ft.?

221. Illustrative Example. Multiply 3678 by 253.

Work	Explanation.
3678	First we multiply by 3; 3
253	times 3678 is 11,034. Then we multiply by
11034	50 (5 tens); 50 times 3678 is 183,900. Then
183900	we multiply by 200 (2 hundreds); 200 times
735600	3678 is 183,900. Adding the partial prod-
930534	ucts, the complete product is 930,534.
	Ans. 930,534.

Written Exercise

222. 1. How many pounds of flour are there in 5 barrels, each containing 196 pounds?

2. How many pounds of cheese are there in 6 cheeses of 172 pounds each?

3. If a person earns \$3.50 every day for 243 days, how much does he earn in all?

4. How much will 900 sheep cost at \$4.75 each?

5. From Chicago to Peoria it is 160 miles. How far does a man travel who goes from Chicago to Peoria and back 10 times?

6. Working 10 hours a day, I can do a piece of work in 37 days. How many days will it take me if I work 1 hour a day?

7. There are 5280 feet in a mile. How many feet long is a telegraph wire that connects Boston, Mass., with Reading, Mass., 12 miles distant?

Multiply:

	a	*b*	*c*
8.	\$5.48 by 423	9877 by 284	9215 by 60
9.	\$8.59 by 758	6735 by 137	4009 by 24
10.	\$9.34 by 475	7354 by 638	6057 by 180
11.	\$40.06 by 65	8423 by 475	7068 by 130
12.	\$312.95 by 108	3526 by 106	6540 by 660
13.	\$22.84 by 52	9122 by 997	5109 by 530
14.	\$5.27 by 307	7395 by 626	3855 by 138
15.	\$70.95 by 483	5038 by 458	4321 by 2156

Oral Exercise

Review pages 31–34, 49, 85, 86, 90–93.

223. 1. If 100 shingles will cover 10 square feet, how many will cover 100 square feet?

2. 4 lobsters sell for $1. What is the price of 1?

How many are:

	a	*b*	*c*	*d*	*e*
3.	$100 \div 2$?	$99 \div 11$?	$96 \div 8$?	$84 \div 12$?	$108 \div 12$?
4.	$45 \div 5$?	$80 \div 10$?	$56 \div 8$?	$60 \div 12$?	$121 \div 11$?
5.	$5\overline{)75}$?	$5\overline{)62}$?	$6\overline{)105}$?	$7\overline{)32}$?	$9\overline{)67}$?
6.	$8\overline{)160}$?	$6\overline{)17}$?	$10\overline{)103}$?	$11\overline{)36}$?	$3\overline{)81}$?

7. James had 84 marbles. He lost $\frac{1}{12}$ of them. How many did he lose?

8. A dozen cookies costs 12 cents. How many dozens cost 60 cents?

9. If 5 gallons of oil cost 75 cents, what is the price per gallon?

10. At 6 cents each, how many oranges cost 66 cents?

11. What do we call the number which is to be divided? the number by which we divide? the result in division?

12. A stable rents for $144 a year. What is the rent per month?

13. In a lot of 84 eggs there are how many dozens?

14. It is how many yards across a road that is 40 feet wide?

15. How many 8-quart pails can be filled from 184 quarts?

Written Exercise

224. Illustrative Example. Divide 33,075 by 82.

WORK

$$\begin{array}{r} 403\frac{29}{82} \\ 82\overline{)33,075} \\ 328 \\ \hline 275 \\ 246 \\ \hline 29 \end{array}$$

EXPLANATION. 82 is not contained in 3 ten thousands any ten thousands times, nor in 33 thousands any thousands times; it is contained in 330 hundreds some hundreds times.

82 is contained in 330 about as many hundred times as 80 is contained in 330, or as 8 is contained in 33, which is 4 times. We write 4 in the hundreds' place in the quotient. 4 (hundred) times 82 = 328 (hundreds), which subtracted from 330 (hundreds) leaves 2 hundreds. Uniting the 7 tens of the dividend with the 2 hundreds we have 27 tens.

82 is contained in 27 tens no tens times. We write a 0 in the tens' place in the quotient. Uniting the 5 ones with the 27 tens we have 275 ones.

82 is contained in 275 about as many times as 8 is contained in 27, which is 3 times. We write 3 in the ones' place in the quotient. 3 times 82 = 246, which subtracted from 275 leaves 29. We express the division of 29 by 82 thus, $\frac{29}{82}$. *Ans.* $403\frac{29}{82}$.

Divide:

1. 3977 by 32	5. 64,124 by 22	9. 62,093 by 73
2. 9660 by 60	6. 130,228 by 24	10. 66,800 by 71
3. 4795 by 63	7. 11,886 by 28	11. 45,200 by 89
4. 1731 by 36	8. 33,022 by 54	12. 23,374 by 29

225. Illustrative Example. Divide 867,345 by 416.

Work

$$\begin{array}{r} 2084\frac{401}{416} \\ 416)867{,}345 \\ \underline{832} \\ 3534 \\ \underline{3328} \\ 2065 \\ \underline{1664} \\ 401 \end{array}$$

Explanation. 416 is not contained in 8 hundred thousands any hundred thousands times, nor in 86 ten thousands any ten thousands times. It is contained in 867 thousands some thousands times. Making 4 (hundreds) of the 416 our trial divisor, we think 416 is contained in 867 thousands 2 thousands times, we write 2 in the thousands' place in the quotient. Multiplying 416 by 2 (thousands), we have 832 (thousands) for the product. 867 (thousands) − 832 (thousands) = 35 (thousands). 35 (thousands) + 3 (hundreds) = 353 (hundreds).

416 is contained in 353 (hundreds) no hundreds times. We write 0 in the hundreds' place in the quotient. 353 (hundreds) + 4 (tens) = 3534 (tens).

416 is contained in 3534 (tens) 8 (tens) times. We write 8 in the tens' place in the quotient. Multiplying 416 by 8 (tens) we have 3328 (tens); 3534 (tens) − 3328 (tens) = 206 (tens). 206 (tens) + 5 (ones) = 2065 (ones).

416 is contained in 2065 (ones) 4 times; we write 4 in the ones' place in the quotient. $416 \times 4 = 1664$; $2065 - 1664 = 401$. *Ans.* $2084\frac{401}{416}$.

Note. In practice we think 416 in 867 two times. $416 \times 2 = 832$. $867 - 832 = 35$. Bring down the 3; 416 in 353 no times, write 0. Bring down the 4; 416 in 3534 eight times, write 8. $416 \times 8 = 3328$. $3534 - 3328 = 206$. Bring down the 5. 416 in 2065 four times, write 4. $416 \times 4 = 1664$. $2065 - 1664 = 401$.

Written Exercise

226. 1. At 18 cents a pound for walnuts, how many pounds can be bought for $7.02?

2. At $1.35 apiece for curtains, how many curtains can be bought for $32.40?

3. How many shrubs at 45¢ each can be bought for $6.30?

4. How many pairs of gloves at $1.25 a pair can be bought for $18?

5. How many hats at $2.87 each can be bought for $25.83?

6. How many dinner tickets at 25 cents each can be had for $28?

7. How many acres of land at $125 an acre can be bought for $25,000?

8. In 1817 it cost $14 to carry a barrel of flour from Pittsburg to Philadelphia. At 18 cents a barrel, how many barrels of flour can now be carried the same distance for $14?

9. If a freight train goes 25 miles an hour, how many hours will it take it to go 1000 miles?

10. There are 5280 feet in a mile. How many times must a wagon wheel turn in going a mile, if it is 16 feet around the rim?

11. The wheel of a trotting gig is 13 feet around the rim. How many times does it turn in going 2 miles?

12. Mr. Ladd planted 1296 hills of corn, in rows of 27 hills each. How many rows did he plant?

Written Exercise

227. Divide:

1.	7,793 by 23	12.	\$76,037 ÷ 73	23.	$221\overline{)42,164}$
2.	4,223 by 39	13.	\$7,793 ÷ 23	24.	$57\overline{)52,623}$
3.	7,793 by 67	14.	\$3,627 ÷ 385	25.	$221\overline{)42,164}$
4.	1,371 by 63	15.	\$68,811 ÷ 82	26.	$807\overline{)74,937}$
5.	2,233 by 54	16.	5,893 ÷ 477	27.	$497\overline{)42,742}$
6.	9,121 by 24	17.	\$61,127 ÷ \$395	28.	$246\overline{)44,999}$
7.	25,632 by 57	18.	57,070 ÷ 102	29.	$329\overline{)60,000}$
8.	5,983 by 47	19.	\$800,070 ÷ 189	30.	$137\overline{)81,063}$
9.	47,380 by 32	20.	768,435 ÷ 482	31.	$648\overline{)75,166}$
10.	90,147 by 43	21.	\$720,451 ÷ 663	32.	$467\overline{)48,899}$
11.	32,203 by 93	22.	\$29,543 ÷ \$961	33.	$579\overline{)72,416}$

34. 12 men hired a barge for \$16.80. What was each man's share?

35. When 50 pounds of beef cost \$11, how much is it a pound?

36. When 36 acres of land cost \$414, how much does 1 acre cost?

37. A club of 21 boys shared equally their camp expenses amounting to \$179.34. What was each boy's share?

38. 12 men shared equally the expenses of a yacht amounting to \$202.20. What was the share of each man?

Written Exercise

228. 1. I buy a woodlot for $1084. I sell the wood cut from it for $594 more than the lot cost. How much do I receive for it?

2. From a farm containing 984 acres there were sold at one time 347 acres, at another 157 acres. How many acres remained?

3. A merchant bought goods for $2467 and sold them for $875 less than he gave. How much did he receive for them?

4. After twice 8642 tons have been taken from 21,020 tons, how many tons remain?

5. If $19.74 was paid for 14 bags of potatoes, how much must be paid for 38 bags?

6. If 38 tons of coal run an engine 1596 miles, how far will 214 tons run it?

7. In 1905, the world's production of copper was 689,277 tons. In that year the production of copper in the United States was 389,122 tons. How much did all other countries produce?

8. How many states of the size of Rhode Island which contains 1248 square miles might be made of Massachusetts which contains 8266 sq. mi. and what area would remain?

9. Texas contains 237,504 square miles. Virginia contains 42,450. How many states the size of Virginia might be made out of Texas, and how many states the size of Massachusetts out of the remainder?

10. 9 of the rooms in a schoolhouse can seat 52 pupils each, and 4 can seat 48 pupils each. How many pupils can all seat?

11. How many feet of fencing will be required to inclose a lot of land measuring on each of two sides 489 feet, on the third 548 feet, and on the fourth 596 feet?

12. In a mixed school there are 7 classes of 54 pupils each; 196 of these pupils are boys. How many are girls?

13. My horse cost $263, my phaëton $230, and my hack 2 times as much as both. How much did all cost?

14. A farmer exchanged 4 cows, worth $68 each, for a span of horses. How much were the horses worth apiece?

15. A merchant bought 44 bales of cotton goods, each bale containing 42 pieces and each piece 38 yards, at 5 cents a yard, and sold the whole at 11 cents a yard. How much did he gain?

16. A farmer raised in one year 364 bushels of corn, the next year twice as much as he did the first year, and the third year three times as much as the second year. How many bushels did he raise in all?

17. A grocer bought 8 chests of tea, each chest containing 48 pounds, at 50 cents a pound. He sold one half of the tea at 65 cents a pound and the other half at 72 cents a pound. How much did he gain?

18. Mr. Curtis bought a piano for $275, paid $14 for freight and cartage, and $2 for tuning, then let it 8 quarters at $15 a quarter, and afterward sold it for $225. Did he gain or lose, and how much?

19. Mrs. Kent, having $2000 to invest, bought 10 United States bonds at $112 each, and then as many shares of railroad stock at $80 each as she could pay for. How many shares did she buy, and how much money was left?

20. In one year my orchard yielded 179 barrels of apples, and the next year 258 barrels. What was the difference and the sum of the yields for the two years?

21. A man borrowed $3850. After paying $640 and $250, how much did he owe?

22. A farmer sells 115 cords of wood at $5 a cord, and 25 tons of hay at $15 a ton. How much does he receive for both?

23. In a cornfield there are 5760 hills of corn. If there are 96 hills in a row, how many rows are there?

24. From one hundred eighty thousand four hundred eighty-one take twenty thousand nineteen.

25. Wishing to build a cottage, I estimated its cost as follows: for the lumber, $650; carpenter's work, $420; hardware, $95; and painting, $60. What was the estimated cost of the cottage?

26. A man gave $550 for a pair of horses which he sold for $480. How much did he lose?

27. Mr. Hays has four oxen. The first weighs 1350 pounds, the second 1425 pounds, the third 1502 pounds, and the fourth 1295 pounds. What is the total weight?

28. A house that cost $7550 was sold for $8420. What was the gain?

29. The cost of footwear for a boy was $2.37 for boots, $1.65 for Oxford ties, $1.25 for slippers, and 85 cents for overshoes. What was the whole cost?

30. A horse cost me $95, a wagon $63, a harness $15. I kept them a week, paying $2.50 for board of the horse, and then sold them for $175. Did I gain or lose, and how much?

31. A ranchman sold 8874 sheep at $4.13 per head. How much did they bring?

32. He sold 4778 beeves, averaging 874 pounds each, at 7 cents a pound. What was received for them?

33. How much do I gain by buying 2 pieces of cambric, each containing 62 yards, for $39.68, and selling them for 40 cents a yard?

34. $16.25 for 13 days' work is how much a day?

35. Among how many boys must $12 be distributed that each may receive 75 cents?

36. I sold 35 barrels of pippins at $1.75 per barrel, 17 barrels of Pome Royals at $1.80 per barrel, 13 barrels of Golden Sweets at $1.25 per barrel, and 25 barrels of russets at $2.25 per barrel. I paid 17 cents a barrel for picking and $12 for freight. How much remained after my expenses were paid?

37. A builder paid for stock and work for a barn $380.75, for mason's work $37.25, for digging and stoning cellar $47.18, for painting $40.00, to the plumber $8.12. He then sold the barn and lost in so doing, $14.30. For how much did he sell it?

Oral and Written Exercise

Review pages 100 and 101.

229. 1. In the fraction $\frac{2}{3}$ which figure tells into how many equal parts a unit has been divided? Which figure shows how many of the equal parts are taken?

230. The number in a fraction that is written below the line and that shows into how many equal parts a unit is divided is called the **denominator.**

231. The number in a fraction that is written above the line and that shows how many equal parts are taken is called the **numerator.**

232. The numerator and denominator are called the **terms** of the fraction.

2. Name the numerators of the fractions: $\frac{8}{11}$; $\frac{1}{3}$; $\frac{2}{7}$; $\frac{4}{6}$; $\frac{7}{8}$. Name the denominators of each of the above fractions.

3. Read: $\frac{3}{16}$; $\frac{5}{12}$; $\frac{8}{9}$; $\frac{4}{13}$; $\frac{6}{11}$; $\frac{5}{6}$; $\frac{4}{9}$; $\frac{1}{20}$; $\frac{3}{10}$; $\frac{21}{25}$. Tell what each term of the above fractions shows.

4. Read: $12\frac{1}{2}$ cents; $16\frac{2}{3}$ cents; $33\frac{1}{3}$ cents; $\$5.87\frac{1}{2}$; $\$6.88$; $\$1.66\frac{2}{3}$; $98\frac{1}{3}$; $73\frac{1}{2}$; $35\frac{7}{8}$; $16\frac{1}{5}$; $87\frac{24}{29}$; $39\frac{1}{5}$; $63\frac{1}{9}$.

233. A number made up of a whole number and a fraction is called a **mixed number.**

Write in figures:

5. Twenty-one thirty-fifths.
6. Nine forty-fourths.
7. One hundred fifty, and sixty-one seventieths.
8. Three dollars, sixty-six and two thirds cents.
9. One dollar, sixty-two and one half cents.

Oral Exercise

234. 1. In the following, name the fractions whose numerators are smaller than their denominators.

$\frac{2}{3}$ $\frac{4}{5}$ $\frac{6}{5}$ $\frac{9}{8}$ $\frac{7}{9}$ $\frac{11}{15}$ $\frac{8}{7}$ $\frac{8}{8}$ $\frac{3}{9}$ $\frac{12}{8}$

2. Name the fractions in example 1 that have numerators equal to, or larger than, their denominators.

235. A fraction that has a numerator less than its denominator is called a **proper fraction** and a fraction that has a numerator equal to, or larger than, its denominator is called an **improper fraction.**

3. What is the smallest fraction that must be added to each of the following to make an improper fraction?

$\frac{1}{5}$ $\frac{3}{8}$ $\frac{7}{11}$ $\frac{5}{12}$ $\frac{8}{13}$ $\frac{7}{14}$ $\frac{9}{15}$ $\frac{19}{24}$ $\frac{25}{33}$ $\frac{33}{40}$.

4. To make a proper fraction what is the smallest fraction that must be subtracted from $\frac{8}{8}$? $\frac{13}{10}$? $\frac{11}{6}$? $\frac{27}{25}$? $\frac{30}{24}$? $\frac{37}{30}$?

5. $\frac{1}{3}$ of 1 yard = —— feet; $\frac{2}{3}$ of 1 yard = —— feet.

6. $\frac{1}{3}$ of 2 yards = —— feet; $\frac{2}{3}$ of 2 yards = —— feet.

7. $\frac{7}{5}$ of 1 nickel = —— cents; $\frac{4}{2}$ of 1 foot = —— feet.

8. $\frac{1}{4}$ of 1 bu. = —— pk.; $\frac{1}{4}$ of 2 bu. = —— pecks.

9. $\frac{3}{4}$ of 1 bu = —— pk; $\frac{3}{4}$ of 2 bu = —— pecks.

10. $\frac{1}{2}$ gallon + $\frac{1}{4}$ gallon = —— gal. = —— quarts; $\frac{1}{2}$ gallon + $\frac{1}{8}$ gallon = —— gal.

11. $1\frac{1}{2}$ gal. + $\frac{1}{2}$ gal. = —— gal.; $\frac{3}{4}$ gal. + $\frac{1}{8}$ gal. gal. = ——

12. $1\frac{1}{4} = \frac{}{4}$; $2\frac{1}{4} = \frac{}{4}$; $1\frac{1}{2} = \frac{}{2}$; $2\frac{2}{3} = \frac{}{3}$; $2\frac{1}{7} = \frac{}{7}$.

13. Change to whole or mixed numbers: $\frac{8}{2}$; $\frac{6}{3}$; $\frac{4}{2}$; $\frac{9}{8}$; $\frac{7}{6}$.

14. What is $\frac{1}{2}$ of 12 + $\frac{2}{3}$ of 12 + $\frac{3}{4}$ of 12 + $\frac{1}{3}$ of 12?

Written Exercise

Review page 103, Art. 193.

236. 1. What is $\frac{1}{3}$ of 45? $\frac{2}{3}$ of 45?

2. What is $\frac{2}{3}$ of 48? of 96? of 120? of 495?

3. What is $\frac{3}{4}$ of 160? of 200? of 960?

4. How much more is $\frac{1}{3}$ of 450 than $\frac{1}{5}$ of 450?

5. How much less than $\frac{1}{4}$ of 280 is $\frac{1}{7}$ of 280?

6. What is $\frac{2}{3}$ of $48 + \frac{3}{4}$ of $60 + \frac{1}{2}$ of 28?

7. Find the sum of $22 + \frac{5}{6}$ of 72; $47 + \frac{3}{12}$ of $96 = ?$

8. What is $\frac{5}{3}$ of 120? of 150? of 210? of 300? of 60?

Find the value of:

9. $\frac{3}{4}$ of a stock of goods valued at \$2880.

10. $\frac{5}{6}$ of a lot of wool valued at \$1860.

11. $\frac{7}{8}$ of a vessel valued at \$24,400.

12. $\frac{7}{12}$ of a house valued at \$6660.

13. $\frac{3}{5}$ of a building lot valued at \$1800.

14. $1\frac{1}{2}$ acres of land valued at \$1200 an acre.

15. $2\frac{1}{4}$ bushels of wheat at 88 cents a bushel.

16. $1\frac{3}{8}$ yards of silk at \$1.60 a yard.

17. $3\frac{1}{2}$ dozen fountain pens at \$15.50 a dozen.

18. $2\frac{1}{2}$ pounds of tea at 56 cents a pound.

19. What is the sum of 45 pages $+ \frac{1}{2}$ of 140 pages?

20. At \$1.50 for 1 yard of carpet, how much will $2\frac{1}{3}$ yards cost?

21. At \$10.60 a day, what are my wages for $3\frac{3}{4}$ days?

Oral Exercise

237. 1. 2 splints + 3 splints = ——— splints. $\frac{2}{5}+\frac{3}{5}=$ ———. $\frac{2}{6}+\frac{3}{6}=$ ———. $\frac{3}{5}+\frac{1}{5}=$ ———. $\frac{2}{7}+\frac{3}{7}=$ ———. $\frac{2+4}{9}=\frac{}{9}$. $\frac{5+6}{12}=\frac{}{12}$.

2. John gave $\frac{1}{4}$ of his marbles to his brother and $\frac{1}{4}$ to his sister. What part of them did he give away?

3. Henry walks $\frac{1}{5}$ of a mile to school, $\frac{2}{5}$ of a mile to the post office, and $\frac{1}{5}$ of a mile to the grocery store. He walks what part of a mile in all?

4. Add: $\frac{1}{4}+\frac{2}{4}$; $\frac{3}{7}+\frac{3}{7}$; $\frac{2}{8}+\frac{3}{8}$; $\frac{4}{12}+\frac{3}{12}$; $\frac{4}{11}+\frac{6}{11}$; $\frac{2+5}{9}$.

5. From $\frac{5}{8}$ of a peck of apples $\frac{3}{8}$ of a peck are sold. How many eighths remain unsold? $\frac{5}{8}-\frac{3}{8}=$ ———.

6. Madge bought $\frac{3}{4}$ of a yard of ribbon. After using $\frac{2}{4}$ of a yard, how much was left? $\frac{3-2}{4}=\frac{}{4}$.

7. From $\frac{3}{4}$ of a dollar Alice spends $\frac{1}{4}$ of a dollar for a concert ticket. How much is left?

Find the sum or remainder as indicated:

	a	*b*	*c*	*d*	*e*
8.	$\frac{5}{7}-\frac{2}{7}$?	$\frac{4}{9}-\frac{3}{9}$?	$\frac{5}{8}-\frac{3}{8}$?	$\frac{8}{9}-\frac{3}{9}$?	$\frac{7-3}{10}$?
9.	$\frac{6}{10}-\frac{3}{10}$?	$6\frac{7}{8}-\frac{2}{8}$?	$8\frac{3}{4}-\frac{2}{4}$?	$7\frac{2}{3}-\frac{1}{3}$?	$\frac{7-3}{11}$?
10.	$\frac{7}{9}-\frac{2}{9}$?	$\frac{8}{12}-\frac{3}{12}$?	$\frac{4}{13}-\frac{6}{13}$?	$\frac{6}{15}-\frac{8}{15}$?	$\frac{12-5}{11}$?
11.	$1\frac{1}{3}+\frac{1}{3}$?	$5\frac{3}{8}-\frac{2}{8}$?	$6\frac{1}{4}+1\frac{3}{4}$?	$\frac{2}{5}+3\frac{1}{5}$?	$\frac{13-7}{12}$?
12.	$2\frac{1}{3}+2\frac{1}{3}$?	$4\frac{1}{4}+1\frac{2}{4}$?	$9\frac{1}{5}+1\frac{2}{5}$?	$7\frac{3}{8}+1\frac{1}{8}$?	$\frac{21-6}{5}$?

13. Margaret sold $\frac{1}{6}$ of a basket of berries to her aunt, $\frac{2}{6}$ at the store, and $\frac{1}{6}$ at a neighbor's. What part did she sell? What part did she have left?

14. Janet studied at home $1\frac{1}{4}$ hours Monday and $1\frac{1}{4}$ hours Tuesday. How much did she study on both days?

Oral Exercise

238. 1. How many quarters are there in \$1? in \$$3\frac{3}{4}$?

2. Change to halves: 1, 2, $1\frac{1}{2}$, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$.

3. In $\frac{5}{3}$ there is 1 yard and how many 3ds over?

4. How many ones and how many 3ds over are $\frac{10}{3}$? $\frac{11}{3}$?

5. Change to mixed numbers: $\frac{6}{5}$, $\frac{8}{3}$, $\frac{9}{4}$, $\frac{11}{5}$, $\frac{15}{4}$, $\frac{21}{6}$, $\frac{14}{4}$, $\frac{20}{7}$.

6. Change to mixed numbers: $\frac{9}{8}$, $\frac{25}{8}$, $\frac{25}{9}$, $\frac{32}{9}$, $\frac{42}{10}$, $\frac{49}{11}$, $\frac{34}{12}$, $\frac{19}{12}$.

Written Exercise

239. Illustrative Example. Reduce (change) $28\frac{3}{5}$ to fifths.

WORK

28
5
140 + 3 = 143 fifths.

SOLUTION. In 1 there are $\frac{5}{5}$; in 28 there are 28 times $\frac{5}{5} = \frac{140}{5}$. $\frac{140}{5} + \frac{3}{5} = \frac{143}{5}$. *Ans.* $\frac{143}{5}$.

Reduce to fractions:

1. $62\frac{7}{8}$	5. $13\frac{3}{4}$	9. $372\frac{2}{3}$	13. $56\frac{3}{8}$	17. $32\frac{6}{7}$
2. $86\frac{15}{16}$	6. $66\frac{1}{4}$	10. $561\frac{5}{6}$	14. $184\frac{5}{12}$	18. $85\frac{14}{15}$
3. $88\frac{7}{8}$	7. $77\frac{8}{13}$	11. $15\frac{11}{16}$	15. $441\frac{4}{5}$	19. $24\frac{3}{4}$
4. $73\frac{3}{5}$	8. $59\frac{8}{9}$	12. $37\frac{2}{5}$	16. $12\frac{11}{20}$	20. $814\frac{2}{3}$

240. Illustrative Ex. Change $\frac{543}{7}$ to a mixed number.

WORK

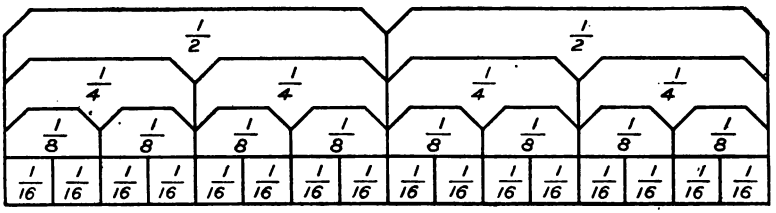
$77\frac{4}{7}$
7)543

SOLUTION. $\frac{7}{7} = 1$. In 543 sevenths there are as many ones as there are 7's in 543, or $77\frac{4}{7}$. *Ans.* $77\frac{4}{7}$.

Reduce to whole or mixed numbers:

21. $\frac{144}{12}$	23. $\frac{172}{15}$	25. $\frac{614}{16}$	27. $\frac{297}{10}$	29. $\frac{74}{3}$	31. $\frac{110}{11}$
22. $\frac{144}{13}$	24. $\frac{401}{20}$	26. $\frac{609}{21}$	28. $\frac{106}{9}$	30. $\frac{240}{5}$	32. $\frac{372}{8}$

Oral Exercise



241. 1. $\frac{1}{2} = \frac{}{4} = \frac{}{8} = \frac{}{16}$.

2. Change $\frac{3}{4}$ to 8ths. To change $\frac{3}{4}$ to 8ths, by what number must both numerator and denominator be multiplied?

3. To change $\frac{3}{8}$ to 16ths, by what number must both terms of $\frac{3}{8}$ be multiplied? $\frac{3}{8} = \frac{}{16}$.

4. Change $\frac{1\frac{2}{16}}{}$ to 4ths. To change $\frac{1\frac{2}{16}}{}$ to 4ths, by what number must both terms of $\frac{1\frac{2}{16}}{}$ be divided?

5. To change $\frac{1\frac{0}{16}}{}$ to 8ths, by what number must both terms of $\frac{1\frac{0}{16}}{}$ be divided? $\frac{1\frac{0}{16}}{} = \frac{\quad}{}$ 8ths.

6. Change $\frac{1\frac{4}{16}}{}$ to 8ths; $\frac{6}{8}$ to 4ths; $\frac{\frac{4}{16}}{}$ to 8ths; $\frac{1\frac{2}{16}}{}$ to 4ths.

Multiplying or dividing both terms of a fraction by the same number changes the terms, but does not change the value of the fraction.

242. **Changing the form of a fraction without changing its value is called *reducing* the fraction.**

243. Multiplying both terms of the fraction by the same number reduces the fraction to larger, or **higher**, terms, and dividing both terms by the same number reduces the fraction to smaller, or **lower**, terms.

Oral Exercise

244. Change:

		a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
1.	To 4ths:	$\frac{1}{2}$	$\frac{2}{2}$	$\frac{4}{8}$	$\frac{2}{8}$	$\frac{6}{8}$	$\frac{3}{12}$	$\frac{6}{12}$	$\frac{8}{16}$
2.	To 6ths:	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{3}$	$\frac{2}{2}$	$\frac{2}{12}$	$\frac{4}{12}$	$\frac{8}{12}$	$\frac{6}{12}$
3.	To 6ths:	$\frac{3}{18}$	$\frac{6}{18}$	$\frac{9}{18}$	$\frac{12}{18}$	$\frac{15}{18}$	$\frac{10}{12}$	$\frac{4}{24}$	$\frac{5}{30}$
4.	To 7ths:	$\frac{2}{14}$	$\frac{4}{14}$	$\frac{8}{14}$	$\frac{10}{14}$	$\frac{3}{21}$	$\frac{6}{21}$	$\frac{12}{21}$	$\frac{8}{28}$
5.	To 8ths:	$\frac{2}{16}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{4}{16}$	$\frac{8}{16}$	$\frac{10}{16}$	$\frac{14}{16}$	$\frac{10}{40}$
6.	To 9ths:	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{2}{18}$	$\frac{10}{18}$	$\frac{16}{18}$	$\frac{3}{27}$	$\frac{12}{27}$	$\frac{12}{36}$
7.	To 10ths:	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{4}{5}$	$\frac{2}{20}$	$\frac{6}{20}$	$\frac{10}{20}$	$\frac{14}{20}$	$\frac{18}{20}$
8.	To 12ths:	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{4}{24}$
9.	To 30ths:	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{1}{6}$	$\frac{5}{6}$	$\frac{1}{5}$	$\frac{4}{5}$	$\frac{3}{10}$	$\frac{2}{15}$

Change to whole or mixed numbers:

10. $\frac{11}{5}$	14. $\frac{50}{7}$	18. $\frac{41}{5}$	22. $\frac{33}{4}$	26. $\frac{75}{2}$
11. $\frac{10}{4}$	15. $\frac{64}{12}$	19. $\frac{44}{11}$	23. $\frac{42}{8}$	27. $\frac{87}{7}$
12. $\frac{9}{3}$	16. $\frac{36}{3}$	20. $\frac{62}{6}$	24. $\frac{28}{6}$	28. $\frac{125}{10}$
13. $\frac{56}{7}$	17. $\frac{82}{7}$	21. $\frac{132}{12}$	25. $\frac{105}{12}$	29. $\frac{65}{9}$

Change to improper fractions:

30. $2\frac{1}{2}$	36. $6\frac{3}{5}$	42. $2\frac{4}{9}$	48. $6\frac{3}{4}$	54. $20\frac{1}{2}$
31. $4\frac{2}{3}$	37. $3\frac{6}{8}$	43. $2\frac{3}{7}$	49. $8\frac{3}{5}$	55. $12\frac{3}{5}$
32. $5\frac{3}{5}$	38. $8\frac{5}{6}$	44. $12\frac{1}{2}$	50. $7\frac{1}{2}$	56. $9\frac{5}{6}$
33. $7\frac{3}{4}$	39. $7\frac{4}{5}$	45. $3\frac{5}{6}$	51. $4\frac{2}{11}$	57. $12\frac{4}{5}$
34. $6\frac{1}{3}$	40. $10\frac{2}{3}$	46. $9\frac{2}{3}$	52. $2\frac{11}{20}$	58. $7\frac{5}{8}$
35. $3\frac{2}{9}$	41. $9\frac{1}{10}$	47. $8\frac{3}{7}$	53. $8\frac{7}{12}$	59. $10\frac{5}{11}$

245. Illustrative Example I. Add $\frac{1}{2}$ and $\frac{1}{4}$.

WORK

$\frac{1}{2}=\frac{2}{4}$

$\frac{2}{4}+\frac{1}{4}=\frac{3}{4}$

EXPLANATION. 1 half and 1 fourth can be added only by changing the terms of 1 half so that it shall have the same denominator that 1 fourth has. $\frac{1}{2}$ equals $\frac{2}{4}$; $\frac{2}{4}$ and $\frac{1}{4}$ are $\frac{3}{4}$. Thus, $\frac{1}{2}+\frac{1}{4}=\frac{3}{4}$. *Ans.* $\frac{3}{4}$.

246. Illustrative Example II. From $\frac{5}{8}$ take $\frac{1}{2}$.

WORK

$\frac{1}{2}=\frac{4}{8}$

$\frac{5}{8}-\frac{4}{8}=\frac{1}{8}$

EXPLANATION. $\frac{1}{2}$ can be taken from $\frac{5}{8}$ only by changing the terms of $\frac{1}{2}$ so that it shall have the same denominator that $\frac{5}{8}$ has. $\frac{1}{2}=\frac{4}{8}$. Then $\frac{5}{8}-\frac{4}{8}=\frac{1}{8}$. *Ans.* $\frac{1}{8}$.

247. **Only like things can be added or subtracted.**

Fractions having unlike denominators must be changed to equivalent fractions having like denominators before they can be added or subtracted.

Written Exercise

248. Find the sum or difference as indicated:

	a	*b*	*c*	*d*
1.	$\frac{1}{3}+\frac{1}{4}$	$\frac{1}{4}+\frac{1}{12}$	$\frac{2}{3}+\frac{1}{4}$	$\frac{11}{12}+\frac{2}{3}+\frac{1}{6}$
2.	$\frac{1}{6}+\frac{1}{2}$	$\frac{1}{3}+\frac{1}{6}$	$\frac{1}{2}+\frac{3}{4}$	$\frac{2}{5}+\frac{3}{10}+\frac{1}{5}$
3.	$\frac{1}{3}-\frac{1}{4}$	$\frac{1}{2}-\frac{1}{4}$	$\frac{1}{4}-\frac{1}{12}$	$\frac{3}{8}-\frac{3}{16}$
4.	$\frac{1}{2}-\frac{1}{12}$	$\frac{3}{4}-\frac{2}{3}$	$\frac{5}{6}-\frac{1}{3}$	$\frac{5}{9}-\frac{5}{18}$
5.	$\frac{1}{6}-\frac{1}{12}$	$\frac{1}{4}-\frac{1}{6}$	$\frac{1}{10}-\frac{1}{20}$	$\frac{15}{20}-\frac{3}{5}$

6. $\frac{2}{3}$ of a yard $-\frac{1}{4}$ of a yard $=$ ——— yard.

7. $\frac{1}{6}$ of a foot $-\frac{1}{12}$ of a foot $=$ ——— inches.

Oral Exercise

249. Find the sum of:

1. $3\frac{1}{8}+2\ +5\frac{1}{8}$.
2. $2\frac{1}{2}+4\frac{3}{8}+6\frac{1}{8}$.
3. $4\frac{1}{5}+2\frac{2}{5}+3\frac{3}{10}$.
4. $14\frac{7}{8}+1\frac{1}{8}+2\frac{1}{4}$.
5. From $8\frac{3}{4}$ take $6\frac{1}{4}$.
6. From $16\frac{2}{3}$ take take $8\frac{1}{3}$.
7. From $1\frac{1}{2}$ feet take $1\frac{1}{4}$ feet.
8. From $\$1\frac{3}{8}$ take $\$1\frac{1}{4}$.

Written Exercise

250. Illustrative Example. Add $306\frac{2}{5}$, $497\frac{3}{5}$, and $86\frac{4}{5}$.

Work	
$306\frac{2}{5}$	2
$497\frac{3}{5}$	3
$86\frac{4}{5}$	4
$890\frac{4}{5}$	$\frac{9}{5}=1\frac{4}{5}$

Explanation. We first add the fractions thus: 4, 7, 9 (5ths); $\frac{9}{5}=1\frac{4}{5}$. We write $\frac{4}{5}$ and add the 1 with the ones in the whole numbers. The total sum is $890\frac{4}{5}$. *Ans.* $890\frac{4}{5}$.

Add:

1. $129\frac{1}{3}$, $224\frac{1}{3}$, $344\frac{2}{3}$
2. $621\frac{1}{2}$, $132\frac{1}{2}$, $213\frac{1}{2}$
3. $356\frac{1}{4}$, $432\frac{1}{8}$, $241\frac{1}{2}$
4. $627\frac{1}{6}$, $242\frac{1}{3}$, $234\frac{1}{6}$
5. $121\frac{1}{8}$, $431\frac{3}{8}$, $214\frac{5}{8}$, $313\frac{1}{2}$
6. $484\frac{1}{4}$, $442\frac{3}{8}$, $366\frac{1}{2}$, $662\frac{1}{8}$
7. $274\frac{1}{2}$, $261\frac{1}{6}$, $562\frac{2}{3}$, $334\frac{1}{2}$
8. $213\frac{2}{3}$, $962\frac{2}{3}$, $924\frac{2}{3}$, $222\frac{1}{3}$

Subtract:

9. $6216\frac{1}{2}$ from $3820\frac{1}{4}$
10. $382\frac{5}{8}$ from $140\frac{1}{2}$
11. $3804\frac{2}{3}$ from $3056\frac{1}{2}$
12. $3622\frac{1}{3}$ from $2892\frac{5}{6}$
13. $625\frac{7}{8}$ from $492\frac{3}{8}$
14. $932\frac{5}{6}$ from $204\frac{2}{3}$
15. $3012\frac{3}{4}$ from $2907\frac{1}{8}$
16. $331\frac{4}{5}$ from $289\frac{3}{10}$

Oral Exercise

251. 1. Measure line A. How long is line A? line B?

2. If each inch represents 1 foot, how many feet does A represent? How many does B represent?

3. If line B represents 2 feet, how many feet does line A represent?

4. If line A represents 1 yard, how many feet does line B represent?

5. Line A is drawn to a scale of 1 inch to the foot. How many yards does it represent?

6. If B is drawn to a scale of 1 inch to the foot, how many yards and feet does it represent?

7. If line A is drawn to a scale of 1 inch to the yard, how many yards does it represent?

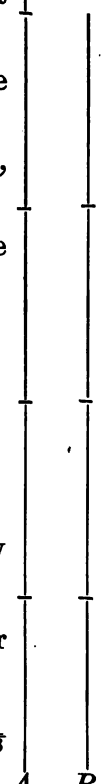
252.

LONG, OR LINEAR MEASURE
12 inches = 1 foot (ft.).
3 feet, or 36 inches = 1 yard (yd.).
$5\frac{1}{2}$ yards, or $16\frac{1}{2}$ feet = 1 rod (rd.).
320 rods, or 5280 feet = 1 mile (mi.).

8. In 1 rod there are how many ft.? How many yards?

9. How many yards is it around a rectangular room 15 ft. wide by 18 ft. long?

10. How many rods is it around a square field $\frac{1}{8}$ mile on each side?



Written Exercise

253. 1. Reduce 3224 inches to feet.

2. 16 rods 5 yards are how much more than 11 rods $3\frac{1}{2}$ yd.?

3. In 683 feet there are how many inches? yards?

4. How many feet are there in $1\frac{1}{2}$ miles? in $1\frac{3}{4}$ miles?

5. How many feet are there in the perimeter of a square garden that is 9 yards on each side?

6. How many rods are there in $2\frac{1}{2}$ miles? in $3\frac{1}{4}$ miles?

7. The East River Bridge in New York is 7200 feet long. It is how many feet longer than 1 mile?

8. Change 16,420 rods to miles.

9. How many rods is it around a square that is $\frac{1}{4}$ of a mile on each side?

10. How many yards are there in 40 rods? in 100 rods?

11. How many feet are there in 40 rods? in 60 rods?

12. How many rods are there in 3 miles? in 1 mile?

13. $\frac{1}{8}$ mile + $\frac{2}{5}$ mile = how many feet?

14. 36 in. + 1 ft. + 15 in. + 1 yd. = —— feet.

15. 1 yd. + $\frac{2}{3}$ of 84 in. = —— yd. —— ft. —— in.

16. $\frac{1}{2}$ of 166 feet − $\frac{1}{6}$ of 120 yards = —— feet.

17. 18 yards + —— feet = 60 feet; 29 feet + —— feet = 11 yards.

18. $\frac{1}{6}$ of 1 foot + $\frac{3}{4}$ of 1 yard = —— feet —— inches.

19. 192 feet + 20 feet = —— yards.

Oral and Written Exercise

254. 1. Name each pair of numbers that multiplied together make

12 18 24 30 36 40 48 60 72

255. The numbers that multiplied together make a product are **factors** of the product. Thus, 3 and 4 are factors of 12.

2. Give the factors of 8, of 12, of 18, as follows:

$8 = 2 \times 4$, $4 \times —$, 8×1, $1 \times —$.

$12 = 2 \times —$, $6 \times —$, $3 \times —$, $4 \times —$, $12 \times —$, $1 \times —$.

$18 = 2 \times —$, $9 \times —$, $3 \times —$, $6 \times —$, $18 \times —$, $1 \times —$.

Give the factors of each number below:

	a	*b*	*c*	*d*	*e*	*f*	*g*
3.	4	14	21	26	32	40	48
4.	6	15	22	27	33	42	49
5.	9	16	24	28	35	44	50
6.	10	20	25	30	36	45	54

256. A number made by using a given number as a factor is called a **multiple**. Thus 12 is a multiple of 2 and 6.

7. Name the smallest multiple of 2 and 3.

257. Because 6 is a multiple of both 2 and 3 and the smallest multiple, it is called the **least common multiple** of 2 and 3.

Copy and write the least common multiple of:

	h	*i*	*j*	*k*	*l*	*m*
8.	3 and 4	2 and 5	4 and 5	4 and 6	9 and 10	9 and 12
9.	3 and 5	3 and 8	5 and 6	4 and 8	8 and 12	10 and 12

Oral Exercise

258. The fractions $\frac{7}{8}$, $\frac{5}{8}$, have the same denominator, 8. Hence they are said to have a **common denominator.**

1. To what fractions having a common denominator can we change $\frac{1}{2}$ and $\frac{1}{3}$?

We can change $\frac{1}{2}$ to $\frac{2}{4}$, $\frac{3}{6}$, $\frac{4}{8}$, $\frac{5}{10}$, $\frac{6}{12}$, $\frac{9}{18}$, etc.

We can change $\frac{1}{3}$ to $\frac{2}{6}$, $\frac{3}{9}$, $\frac{4}{12}$, $\frac{6}{18}$, etc.

259. From the above we see that $\frac{1}{2}$ and $\frac{1}{3}$ can be changed to 6ths, to 12ths, 18ths, etc., and that 6 is the **least common denominator** to which they can both be changed.

Notice that the denominators 6, 12, and 18 are common multiples of the denominators of $\frac{1}{2}$ and $\frac{1}{3}$ and that 6 is their least common multiple.

260. Illustrative Example. Change $\frac{5}{12}$ and $\frac{5}{9}$ to fractions having the least common denominator.

WORK

$$\frac{5}{12}=\frac{5\times3}{12\times3}=\frac{15}{36}$$

$$\frac{5}{9}=\frac{5\times4}{9\times4}=\frac{20}{36}$$

EXPLANATION. To change $\frac{5}{12}$ and $\frac{5}{9}$ to fractions having the least common denominator, we take for the denominator the least common multiple of 12 and 9.

24 is a multiple of 12, but it is not a multiple of 9. The next multiple of 12 is 36 which is also a multiple of 9. So 36 is taken as the least common denominator. *Ans.* $\frac{5}{12}=\frac{15}{36}$ and $\frac{5}{9}=\frac{20}{36}$.

261. Fractions that have a common denominator are called **similar fractions.**

Written Exercise

262. Change to fractions having a common denominator:

1. $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}$
2. $\frac{1}{2}, \frac{3}{4}, \frac{2}{5}$
3. $\frac{5}{9}, \frac{1}{6}, \frac{3}{4}$
4. $\frac{3}{8}, \frac{5}{3}, \frac{7}{5}$
5. $\frac{3}{4}, \frac{1}{8}, \frac{2}{3}$
6. $\frac{3}{5}, \frac{2}{9}, \frac{1}{8}$
7. $\frac{1}{16}, \frac{3}{8}, \frac{3}{4}$
8. $\frac{2}{3}, \frac{5}{6}, \frac{3}{8}$
9. $\frac{5}{9}, \frac{3}{12}, \frac{1}{3}$

263. Illustrative Example. Change to similar fractions and add $\frac{3}{4}+\frac{1}{6}+\frac{1}{5}$.

WORK

$$\frac{3}{4}=\frac{3\times15}{4\times15}=\frac{45}{60}$$
$$\frac{1}{6}=\frac{1\times10}{6\times10}=\frac{10}{60}$$
$$\frac{1}{5}=\frac{1\times12}{5\times12}=\frac{12}{60}$$
$$\frac{67}{60}=1\frac{7}{60}$$

EXPLANATION. By trial we find that $\frac{3}{4}$ and $\frac{1}{6}$ can be changed to 12ths, but 12 is not a multiple of 5. The next multiple of 12 which is a multiple of 5 is 60. So 60 is taken as the least common denominator.

$\frac{3}{4}=\frac{45}{60}$; $\frac{1}{6}=\frac{10}{60}$; $\frac{1}{5}=\frac{12}{60}$.

$\frac{45}{60}+\frac{10}{60}+\frac{12}{60}=\frac{67}{60}=1\frac{7}{60}$ *Ans.* $1\frac{7}{60}$.

Change the fractions to similar fractions and add:

10. $\frac{1}{4}+\frac{2}{3}+\frac{1}{2}$
11. $\frac{1}{4}+\frac{5}{6}+\frac{5}{12}$
12. $\frac{1}{10}+\frac{3}{5}+\frac{5}{12}$
13. $\frac{1}{6}+\frac{2}{3}+\frac{3}{5}$
14. $\frac{9}{10}+\frac{1}{6}+\frac{3}{4}$
15. $\frac{2}{5}+\frac{3}{7}+\frac{1}{10}$
16. $\frac{7}{8}+\frac{5}{12}+\frac{1}{6}$
17. $\frac{4}{5}+2\frac{3}{10}+1\frac{1}{2}$
18. $\frac{1}{2}+\frac{2}{3}+\frac{5}{6}$
19. $1\frac{4}{5}+3\frac{1}{2}+5\frac{3}{5}$
20. $2\frac{1}{7}+\frac{1}{3}+\frac{1}{6}$
21. $\frac{7}{10}+\frac{1}{2}+\frac{3}{8}$

Change the fractions to similar fractions and subtract:

22. $\frac{7}{8}-\frac{5}{12}$
23. $\frac{4}{5}-\frac{1}{3}$
24. $\frac{3}{4}-\frac{3}{9}$
25. $\frac{3}{4}-\frac{2}{5}$
26. $4\frac{7}{10}-\frac{3}{5}$
27. $5\frac{1}{2}-\frac{1}{8}$
28. $\frac{7}{12}-\frac{1}{2}$
29. $8\frac{5}{6}-4\frac{2}{3}$
30. $3\frac{4}{5}-1\frac{3}{8}$
31. $2\frac{6}{8}-1\frac{2}{5}$
32. $4\frac{1}{4}-\frac{1}{5}$
33. $\frac{5}{7}-\frac{1}{12}$
34. $12\frac{1}{2}-8\frac{1}{3}$
35. $28\frac{5}{7}-1\frac{5}{6}$
36. $14\frac{2}{7}-12\frac{2}{9}$
37. $37\frac{1}{2}-9\frac{1}{15}$

Oral Exercise

264. 1. 4 times \$6 = \$ —. 4 times 6 tenths = — tenths.

2. $4 \times \frac{6}{10} = ?$ $4 \times \frac{3}{7} = ?$ $3 \times \frac{2}{5} = ?$ $5 \times \frac{1}{9} = ?$ $6 \times \frac{3}{10} = ?$

3. $6 \times \frac{1}{8} = ?$ $7 \times \frac{2}{15} = ?$ $2 \times \frac{4}{9} = ?$ $3 \times \frac{4}{13} - ?$ $8 \times \frac{3}{2} = ?$

4. To multiply a fraction by a whole number, what term of the fraction do you multiply?

5. In multiplying as above, did you change the denominator in any way?

6. If 1 dozen oranges cost $\frac{1}{4}$ of a dollar, how much will six dozen cost?

Written Exercise

265. Multiply:

1. $\frac{2}{3}$ by 5	5. $\frac{5}{8}$ by 14	9. $\frac{7}{12}$ by 24	13. $\frac{5}{24}$ by 7
2. $\frac{3}{4}$ by 9	6. $\frac{7}{10}$ by 17	10. $\frac{8}{9}$ by 60	14. $\frac{4}{15}$ by 6
3. $\frac{4}{5}$ by 11	7. $\frac{9}{10}$ by 25	11. $\frac{8}{15}$ by 40	15. $\frac{9}{20}$ by 18
4. $\frac{5}{6}$ by 13	8. $\frac{6}{6}$ by 16	12. $\frac{7}{9}$ by 70	16. $\frac{11}{12}$ by 29

17. What must be paid for 3 yards of silk at \$$\frac{3}{8}$ a yard? What must be paid for 13 yards?

18. At \$$\frac{5}{8}$ each what is the cost of the cane-seating of half a dozen chairs? of 2 dozen chairs?

19. A pipe discharges $\frac{7}{8}$ of a gallon of water a second. How many gallons is that to a minute?

20. At \$$\frac{3}{10}$ an hour, how many dollars will it take to pay for 70 hours' work? for 90 hours' work?

266. Illustrative Example. Multiply $15\frac{3}{4}$ by 7.

WORK

$15\frac{3}{4}$
7
$5\frac{1}{4}$
105
$110\frac{1}{4}$

EXPLANATION. 7 times $\frac{3}{4} = \frac{21}{4} = 5\frac{1}{4}$; 7 times 15 = 105; $105 + 5\frac{1}{4} = 110\frac{1}{4}$. *Ans.* $110\frac{1}{4}$.

Oral Exercise

	a	*b*	*c*	*d*
Multiply: 1.	$7\frac{2}{6}$ by 5	$10\frac{2}{7}$ by 4	$9\frac{3}{4}$ by 3	$5\frac{2}{3}$ by 4
2.	$3\frac{2}{5}$ by 9	$6\frac{7}{8}$ by 2	$8\frac{3}{5}$ by 8	$12\frac{1}{2}$ by 7

Find the cost of the following lots of misses' shoes:

3. 4 doz. pairs at $\$10\frac{1}{3}$ per dozen.
4. 6 doz. pairs at $\$8\frac{3}{4}$ per dozen.
5. 10 doz. pairs at $\$12\frac{1}{2}$ per dozen.
6. 4 doz. pairs at $\$11\frac{4}{5}$ per dozen.

Written Exercise

267. Multiply:

1. $19\frac{4}{7}$ by 6	4. $41\frac{3}{4}$ by 12	7. $81\frac{5}{12} \times 12$
2. $33\frac{5}{8}$ by 9	5. $18\frac{6}{7}$ by 10	8. $14\frac{2}{3} \times 15$
3. $12\frac{2}{5}$ by 17	6. $91\frac{7}{11}$ by 13	9. $12\frac{1}{2} \times 24$

10. What is the cost of 3 suits at $\$36\frac{3}{4}$ each?

11. What is the distance around a field that is $7\frac{2}{3}$ rods square?

12. The yearly cost of school books being $\$2\frac{5}{8}$ per pupil, what is the cost for 60 pupils?

13. $16\frac{1}{2}$ feet equal 1 rod. How many feet are there in 320 rods?

Review pages 83, 84, and 95, and repeat the table of long measure on page 143.

Learn this table:

268.

SQUARE MEASURE

144 square inches = 1 square foot (sq. ft.).
9 square feet = 1 square yard (sq. yd.).
30¼ square yards = 1 square rod (sq. rd.).
160 square rods = 1 acre (A.).
640 acres = 1 square mile (sq. mi.).

Oral Exercise

269. 1. Reduce to square yards 36 square feet; 54 sq. ft.

2. How many square feet are there in $1\frac{1}{3}$ sq. yd.?

3. $\frac{1}{2}$ acre equals how many square rods?

4. How many square rods are there in a field 8 rods square?

5. How many acres are there in a field 20 rd. by 8 rd.?

Written Exercise

270. 1. How many square yards of turf are there in a lawn that is 10 feet wide and 12 feet long?

2. How many square yards are there in a rectangular floor 150 ft. by 20 ft.?

3. Change 1600 sq. rd. to sq. yd.; to sq. ft.

4. Find the number of acres in 27 square miles.

5. Find the number of square rods in an athletic field 15 rods long, 12 rods wide. Find the number of acres in it.

6. How many square rods are there in $2\frac{1}{2}$ acres?

Review pages 97 to 99.

Oral Exercise

271. The solid contents of a solid is called its **volume.**

1. Find the number of cubic inches in a cubic foot, $12 \times 12 \times 12 =$ ——.

2. Find the number of cubic feet in a cubic yard.

Learn this table:

272.

CUBIC MEASURE

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.).
27 cubic feet = 1 cubic yard (cu. yd.).
128 cubic feet = 1 cord (cd.).

NOTE. The teacher should explain the use of the cord for measuring wood. As generally understood a cord of wood is a pile 4 ft. wide, 4 ft. high, and 8 ft. long.

3. A wall is 1 yard wide, 1 yard high, and 30 yards long. It contains how many cubic yards?

4. A candy box is 6 inches long, 3 inches wide, and $1\frac{1}{2}$ inches deep. Find its volume in cubic inches.

5. How many cords of wood are there in a pile 4 feet high, 4 feet wide, and 8 feet long?

6. How many cords of wood are there in a pile 4 ft. high, 4 ft. wide, and 16 ft. long?

7. How many cords of hemlock bark are there in a pile 4 ft. high, 4 ft. wide, and 48 ft. long?

Written Exercise

273. 1. How many cubic feet are there in 6 cords and 30 cubic feet?

2. Reduce 15,640 cubic feet to cubic yards.

3. Reduce 2941 cubic feet to cords and cubic feet.

4. At $1.50 per cubic yard it will cost how much to dig a drain 240 feet long, 3 feet deep, and $1\frac{1}{3}$ feet wide?

5. What are the contents in cubic yards of a reservoir 80 feet long, 80 feet wide, and 18 feet deep?

6. How many cubic feet are there in 11 cubic yards?

7. How many cubic yards are there in a cellar 9 yards square and 4 yards deep?

8. The inside dimensions of a locker are $1\frac{1}{2}$ feet wide, 1 foot deep, and 8 feet long. How many cubic feet does it contain? It is divided into two equal compartments. How many cubic feet does each contain?

9. The water is 2 feet deep in a tank that is 14 feet long and 9 feet wide on the inside. How many cubic feet of water does it contain?

10. How many cubic feet of wood are there in a pile of wood containing 6 cords?

11. How many cubic feet of water will a tank hold that is 3 feet by 8 feet by 12 feet inside measure?

12. There are 231 cubic inches in a gallon. How many gallons of water will the above tank (Ex. 11) hold?

13. Measure the length, width, and height of the schoolroom. How many cubic feet of air does it contain?

Oral and Written Exercise

Review pages 10, 11, 116, 117.

274. Read:

1. 9,999	5. 47,800	9. 465,102
2. 30,000	6. 220,000	10. 8,425,572
3. 74,002	7. 408,206	11. 14,601,000
4. 84,062	8. 608,030	12. 5,001,000,402

Write in figures:

13. 32 thousand, 6 hundred 51.

14. 605 thousand, 7 hundred.

15. 2 million, 3 thousand, 6 hundred 84.

16. 9 million, 70 thousand, 7 hundred 6.

17. 410 million, 238 thousand, 6 hundred 42.

18. Add 1 to 999 and write the result.

19. Take 1 from 10,000 and write the result.

20. Add 1 to 3999 and write the result.

21. Add 1 to 19,999 and write the result.

22. Subtract 1 from 69,000 and write the result.

23. Subtract 1 from 600,000 and write the result.

24. Add 1 to 499,999 and write the result.

25. Write the largest number that it is possible to write in three figures; the largest it is possible to write in four figures; in five figures.

26. In 27,630 there are how many thousands? how many tens? how many hundreds?

Oral Exercise

275. 1. From a tank containing 42 gallons, 11 gallons leaked out. How many gallons remained?

2. A windmill pumping at the rate of 25 gallons in an hour pumps how many gallons in 5 hours?

3. A paymaster pays 8 men $96, giving them equal amounts. How much does each receive?

4. How many 25-cent pieces can be obtained in exchange for a $2 bill?

5. How many 4-ounce packages can be made from a can of spice containing 10 pounds?

6. In $\frac{3}{4}$ of an hour there are how many minutes? In $\frac{3}{4}$ of 2 hours there are how many minutes?

7. How many inches are there in 1 yard? in $\frac{2}{3}$ of a yard? In $\frac{1}{3}$ of 3 yards there are how many inches? how many yards?

8. In $\frac{8}{10}$ of an hour there are how many minutes?

9. How many nickels are equal to 90 cents? to $1? to 60 cents? to 40 cents? to 30 cents?

10. How many yards are equal to 90 feet? to 99 feet? to 120 feet? to 60 feet? to 24 feet?

11. How many cubic feet will a wagon body hold that is 6 feet long, 3 feet wide, and 1 foot deep, inside measure?

12. How many pounds in $\frac{1}{7}$ of a bushel of rye weighing 56 lb.? in $\frac{1}{8}$ of a bushel? in $\frac{5}{8}$ of a bushel?

13. Read the following: XXII, XCIV, MDC, XLIX.

Oral and Written Exercise

276. 1. If 5 quarts of milk raised 2 pints of cream, what part of the milk was cream? How many pints of skimmed milk were left?

2. If 10 quarts of milk will raise 2 quarts of cream, how many quarts of milk will raise 1 gallon? 10 gallons?

3. Find the cost of a school luncheon as follows:

18 quarts of milk at 6¢ per quart.
2 cans of cocoa at 20¢ per can.
6 pounds of sugar at 5¢ per pound.
1 pound of butter crackers at 10¢ per pound.

4. If there are 25 children in the school, what is the cost per child for the luncheon (Ex. 3)?

5. The following recipe for potato soup is for four persons. Reduce the amounts so that it will serve 2 persons instead of 4 persons.

6 potatoes.	2 tablespoonfuls of butter.
1 quart of milk.	2 tablespoonfuls of cream.
1 teaspoonful of salt.	$\frac{1}{4}$ teaspoonful of celery salt.

6. In June of a certain year 20 days were fair, 6 were cloudy, and 4 were rainy. What part of the month was fair? What part was cloudy? What part was rainy?

7. There are how many hours and minutes from 20 minutes after 6 in the morning to half past 10?

8. If a line 1 inch long on a map represents a distance of 300 miles, what is the distance between two places that are represented 6 inches apart?

Written Exercise

277. 1. If land yields 27 bushels of wheat to the acre, how many acres will yield 1000 bushels?

2. How much is a man's sidewalk assessment for a walk 4 rods long at the rate of $3 per running foot?

3. A flock of 100 sheep weighs 2 tons 900 pounds. What is the average weight per sheep?

4. The average food supply for one week for a grown person is as follows:

Meat, 3 pounds.	Flour and cereal, 5 pounds.
Fruit, 3 pounds.	Vegetables, 5 pounds.
Sugar, 1 pound.	Butter, $\frac{3}{4}$ of a pound.

What is the total weight of a week's food? What is the weight of food for 5 persons for a week?

5. In the walls of a room 28 feet long, 20 feet wide, and 10 feet high, there are how many square feet?

6. In $\frac{1}{2}$ of $\frac{1}{4}$ of a ton there are how many pounds?

7. Copy and add: $14.92, $16.09, $31.43, $86.11, $98.71, $27.69, $143.62, $29.67, $9.31, $19.72, $6.14, $436.89.

8. Find the cost of 32 bushels of oats at $37\frac{1}{2}¢$ a bushel.

9. How many rods of fence are needed for a railway that is 8 miles long, both sides of the road being fenced?

10. The highest temperature on three successive days was 76° above 0°, 83° above 0°, and 81° above 0°. What was the average for the three days?

Oral Exercise

BOSTON TO NEW YORK VIA PROVIDENCE

STATIONS		1	7	9	11	17	21
		Nt.	A.M.	A.M.	A.M.	P.M.	P.M.
Boston		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3 00
Providence	Due	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4 03
Providence	Leave	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4 07
New London	Due	[illegible]	[illegible]	[illegible]	[illegible]	3 45	5 30
New London	Leave	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Saybrook Junction		.....	.....	.....	.....	4 15	6 03
New Haven	Due	4 40	[illegible]	[illegible]	[illegible]	[illegible]	6 45
New Haven	Leave	4 45	[illegible]	[illegible]	[illegible]	[illegible]	6 50
So. Norwalk		5 41	.....	.....	[illegible]	[illegible]	.....
Stamford		5 58	.....	.....	[illegible]	6 10	.....
New York, G. C. Sta.	Due	[illegible]	[illegible]	3 00	[illegible]	[illegible]	8 30
		A.M.	P.M.	P.M.	P.M.	P.M.	P.M.

278. 1. How long does it take the train leaving Boston at 8 A.M. to run to New York?

2. What is the running time of train No. 11 between Providence and New London? between Providence and Stamford?

3. What is the running time from Boston to New Haven of train No. 17? of train No. 9? What is the difference in their running time?

4. Train No. 17 arrives in New York at what time? Train No. 21 arrives how much later?

5. Train No. 7 leaves Boston at what time? I wish to stop over until the next train in New London. How long can I stay in New London?

6. What is the exact difference in the running time of trains No. 9 and 17 between Boston and New Haven? between Boston and New York?

Review page 145.

Oral Exercise

279. 1. Give the factors of the following numbers:

6 9 12 15 14 8 10 20 16 18

There are some numbers, as 3, 5, 7, 11, 13, and 17, that have no factors except themselves and one.

280. A number that has no factors except itself and one is called a **prime number.**

281. A number that has other factors besides itself and one is called a **composite number.**

282. Factors that are prime numbers are called **prime factors.** Thus 3 and 5, which multiplied together make 15, are called the prime factors of 15.

2. Tell which of the following numbers are composite:

2 6 7 8 10 13 15 22 19 29 40

3. Tell which of the above numbers are prime and why.

4. Tell which of the following numbers can be divided by 2 without a remainder. Tell which cannot be thus divided.

5 2 6 7 4 8 9 10 11 15 12

283. A number that is divisible by 2 without a remainder is called an **even number.**

284. A number that is not divisible by 2 without a remainder is called an **odd number.**

5. Name the even numbers from 2 to 30. Name the odd numbers from 1 to 31.

Oral Exercise

285. *Any number can be exactly divided by each of its factors.*

1. Name the prime factors of: 12, 9, 15, 21, 6, 8, 27.

2. Divide 21 by each of its factors and give the quotients.

3. Name a factor of 6 that is also a factor of 9; of 12.

286. A factor that is common to two or more numbers is called a **common factor**; it is also a **common divisor.**

4. Name a common factor or divisor of 10 and 15; of 9 and 27; 6 and 24; 9 and 18; 12 and 18; 14 and 21.

5. What is the largest number that is a common factor or divisor of 12 and 18? of 14 and 28? of 9 and 24?

287. The largest number that will exactly divide two or more numbers is called the **greatest common divisor** of the numbers.

288. Name the greatest common divisor of the following numbers:

	a	*b*	*c*
6.	6, 12, and 18	7, 14, and 21	2, 4, and 6
7.	10, 20, and 30	9, 12, and 18	24, 16, and 32
8.	24, 30, and 36	3, 6, and 9	12, 16, and 20
9.	5, 15, and 25	4, 8, and 12	16, 24, and 40

10. What number is the product of the factors 3 and 5?

289. What do we call a number that is made by using a given number as a factor? (See page 145.)

11. Name multiples of: 2, 3, 4, 5, 8, 6, 7, 9, 10.

Oral Exercise

290. 1. Name any number that is a common multiple of 4 and 6.

2. Name the least number that is a common multiple of 4 and 6.

291. A **common multiple** of two or more numbers contains all the factors of all the numbers.

292. The **least common multiple** of two or more numbers is the least number that contains all the factors of all the given numbers. We write l. c. m. for least common multiple.

Written Exercise

293. Ill. Ex. What is the l. c. m. of 6, 9 and 15?

WORK

$6 = 3 \times 2$
$9 = 3 \times 3$
$15 = 3 \times 5$
l. c. m. $= 3 \times 2 \times 3 \times 5 = 90.$

EXPLANATION. The prime factors of 6 are 3 and 2; of 9, 3 and 3; of 15, 3 and 5.

To contain 6, the l. c. m. must contain 3 and 2 as factors. To contain 9, it must contain two 3's as factors; in the factors of 6 there is one 3; so we add but one more factor 3 to get the l. c. m. of 9 and 6. To contain 15 the l. c. m. must contain 3 and 5 as factors. But 3 is a factor of both 6 and 9, so we add only the factor 5 to get the l. c. m. of 15, 9, and 6. The product of $3 \times 2 \times 3 \times 5 = 90$. Then 90 is the least number that contains all the factors of 15, 9, and 6 and hence is their l. c. m. *Ans.* 90.

1. Find the l. c. m. of 3, 4, and 6; of 5, 6, and 10.

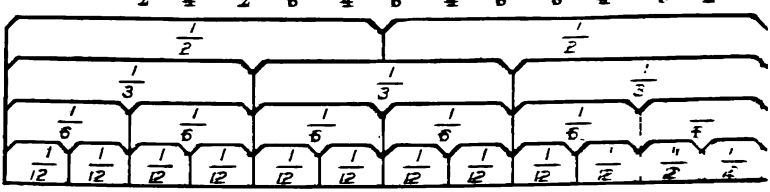
Oral Exercise

Find the l. c. m. of the following numbers:

	a	*b*	*c*	*d*
1.	4, 8, 6	4, 5, 6	12, 6, 8	15, 3, 6
2.	3, 5, 7	8, 4, 3	14, 6, 8	18, 9, 4

Supply the missing numerators in Example 3 below:

294. 3. $\frac{1}{2}=\frac{\quad}{4}$. $\frac{1}{2}=\frac{\quad}{6}$. $\frac{1}{4}=\frac{\quad}{8}$. $\frac{2}{4}=\frac{\quad}{8}$. $\frac{1}{6}=\frac{\quad}{12}$. $\frac{1}{6}=\frac{\quad}{12}$.



Using the diagram above, tell the fractional equivalents in Examples 4 and 5.

4. $\frac{1}{2}=\frac{\quad}{6}=\frac{\quad}{12}$. $\frac{1}{3}=\frac{\quad}{6}=\frac{\quad}{12}$. $\frac{2}{3}=\frac{\quad}{6}=\frac{\quad}{12}$. $\frac{3}{12}=\frac{\quad}{4}$.

5. $\frac{4}{12}=\frac{\quad}{3}=\frac{\quad}{6}$. $\frac{6}{12}=\frac{\quad}{2}=\frac{\quad}{6}$. $\frac{3}{6}=\frac{\quad}{2}=\frac{\quad}{12}$. $\frac{3}{12}=\frac{\quad}{4}$.

6. Change $\frac{1}{2}$ to 4ths, 6ths, 8ths, 12ths, 16ths, 24ths.

7. Change $\frac{1}{3}$ to 6ths, 12ths, 9ths, 15ths; change $\frac{2}{3}$ to 6ths, 12ths, 9ths, 15ths.

8. To change $\frac{1}{2}$ to $\frac{3}{6}$, both terms of $\frac{1}{2}$ must be multiplied by what number?

9. To change $\frac{5}{10}$ to $\frac{1}{2}$, both terms of $\frac{5}{10}$ must be divided by what number?

10. $\frac{5\div5}{10\div5}=\frac{\quad}{\quad}$. $\frac{1\times2}{2\times2}=\frac{\quad}{\quad}$. $\frac{2\times4}{5\times4}=\frac{\quad}{\quad}$. $\frac{6\div2}{8\div2}=\frac{\quad}{\quad}$.

11. May both terms of any fraction be multiplied or divided by the same number without changing the value of the fraction?

Written Exercise

295. 1. How do you reduce a fraction to an equivalent fraction of higher terms? of lower terms?

2. Change $\frac{1}{3}$ to 15ths; $\frac{2}{3}$ to 12ths; $\frac{2}{5}$ to 20ths; $\frac{4}{7}$ to 21sts.

3. Change to 24ths: $\frac{2}{4}$, $\frac{6}{8}$, $\frac{3}{6}$, $\frac{6}{12}$, $\frac{8}{12}$, $\frac{9}{12}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$.

4. Change to larger terms: $\frac{1}{3}$, $\frac{2}{3}$, $\frac{2}{6}$, $\frac{4}{12}$, $\frac{1}{8}$, $\frac{5}{8}$, $\frac{7}{12}$, $\frac{7}{9}$.

5. Change to halves: $\frac{4}{8}$, $\frac{5}{10}$, $\frac{7}{14}$, $\frac{8}{16}$, $\frac{9}{18}$, $\frac{10}{20}$.

296. When there is no number but 1 that will exactly divide both terms of a fraction, it is expressed in its **lowest terms.**

297. Illustrative Example. Reduce $\frac{16}{24}$ to an equivalent fraction in its lowest terms.

WORK

$16 \div 8 = 2$

$24 \div 8 = 3$

CANCELED

$$\frac{\cancel{16}^{2}}{\cancel{24}_{3}} = \frac{2}{3}$$

EXPLANATION. To change $\frac{16}{24}$ to a fraction in its lowest terms, we divide both terms by the largest number that will exactly divide both terms; in other words, we strike out the common factor 8 from both terms. Dividing both terms by 8 gives the fraction $\frac{2}{3}$. Therefore, the fraction equivalent to $\frac{16}{24}$ is $\frac{2}{3}$.

Ans. $\frac{2}{3}$.

298. Striking out a common factor is called **canceling.**

Change to fractions in their lowest terms by canceling:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
6.	$\frac{3}{21}$	$\frac{12}{18}$	$\frac{9}{27}$	$\frac{24}{36}$	$\frac{18}{24}$	$\frac{14}{22}$	$\frac{22}{30}$	$\frac{30}{35}$	$\frac{24}{32}$
7.	$\frac{6}{21}$	$\frac{12}{26}$	$\frac{16}{36}$	$\frac{18}{26}$	$\frac{10}{18}$	$\frac{16}{24}$	$\frac{20}{28}$	$\frac{30}{36}$	$\frac{28}{32}$

8. Reduce to 16ths: $\frac{3}{8}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{2}{4}$, $\frac{5}{8}$; to 12ths: $\frac{5}{6}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{2}{3}$.

Written Exercise

299. Illustrative Examples. (1) Add $\frac{3}{4}$, $\frac{1}{6}$, and $\frac{1}{8}$.

(2) From $\frac{3}{4}$ take $\frac{3}{10}$.

(1) WORK

l. c. m.

$4 = 2 \times 2$
$6 = 3 \times 2$
$8 = 2 \times 2 \times 2$
$2 \times 2 \times 2 \times 3 = 24$

$\frac{3}{4} = \frac{18}{24}$
$\frac{1}{6} = \frac{4}{24}$
$\frac{1}{8} = \frac{3}{24}$
$\frac{25}{24} = 1\frac{1}{24}$

EXPLANATION. (1) To add $\frac{3}{4}$, $\frac{1}{6}$, and $\frac{1}{8}$, we first change the fractions to equivalent fractions having the least common denominator, which is 24. $\frac{3}{4} = \frac{18}{24}$; $\frac{1}{6} = \frac{4}{24}$; $\frac{1}{8} = \frac{3}{24}$. $\frac{18}{24} + \frac{4}{24} + \frac{3}{24} = \frac{25}{24} = 1\frac{1}{24}$. *Ans.* $1\frac{1}{24}$.

(2) WORK

l. c. m.

$4 = 2 \times 2$
$10 = 2 \times 5$
$2 \times 2 \times 5 = 20$

$\frac{3}{4} = \frac{15}{20}$
$\frac{3}{10} = \frac{6}{20}$
$\frac{9}{20}$

(2) To subtract $\frac{3}{10}$ from $\frac{3}{4}$, we first change $\frac{3}{4}$ and $\frac{3}{10}$ to equivalent fractions having the least common denominator, which is 20. $\frac{3}{4} = \frac{15}{20}$; $\frac{3}{10} = \frac{6}{20}$; $\frac{15}{20} - \frac{6}{20} = \frac{9}{20}$. *Ans.* $\frac{9}{20}$.

300. Add or subtract as indicated:

	a	*b*	*c*	*d*
1.	$\frac{3}{8} + \frac{5}{6} + \frac{1}{4}$	$\frac{1}{10} + \frac{4}{5} + \frac{3}{4}$	$\frac{7}{10} + \frac{5}{6} + \frac{2}{5}$	$\frac{7}{8} + \frac{3}{10} + \frac{1}{4}$
2.	$\frac{1}{6} + \frac{2}{3} + \frac{3}{4}$	$\frac{7}{8} + \frac{1}{4} + \frac{1}{2}$	$\frac{4}{5} + \frac{2}{3} + \frac{1}{2}$	$\frac{5}{9} + \frac{5}{6} + \frac{3}{4}$
3.	$\frac{4}{9} + \frac{1}{3} + \frac{5}{6}$	$\frac{5}{12} + \frac{1}{6} + \frac{2}{3}$	$\frac{4}{7} + \frac{1}{3} + \frac{6}{7}$	$\frac{1}{12} + \frac{2}{3} + \frac{5}{8}$
4.	$\frac{3}{4} + \frac{1}{2} + \frac{2}{3}$	$\frac{5}{8} + \frac{3}{10} + \frac{1}{4}$	$\frac{3}{7} + \frac{1}{6} + \frac{1}{3}$	$\frac{3}{10} + \frac{3}{8} + \frac{3}{5}$

	e	*f*	*g*	*h*	*i*
5.	$\frac{3}{4} - \frac{1}{6}$	$\frac{5}{6} - \frac{7}{12}$	$\frac{2}{3} - \frac{4}{9}$	$\frac{3}{4} - \frac{3}{10}$	$\frac{7}{8} - \frac{7}{10}$
6.	$\frac{4}{5} - \frac{7}{10}$	$\frac{5}{6} - \frac{7}{9}$	$\frac{7}{10} - \frac{2}{3}$	$\frac{7}{8} - \frac{5}{12}$	$\frac{3}{5} - \frac{3}{8}$
7.	$\frac{3}{4} - \frac{1}{2}$	$\frac{3}{4} - \frac{4}{9}$	$\frac{2}{3} - \frac{2}{5}$	$\frac{3}{5} - \frac{5}{10}$	$\frac{3}{7} - \frac{1}{4}$

Written Exercise

301. Illustrative Example. Add $7\frac{5}{6}$, $8\frac{2}{3}$, and $4\frac{5}{12}$.

Work	l. c. m. 12
$7\frac{5}{6} = 7\frac{10}{12}$	10
$8\frac{2}{3} = 8\frac{8}{12}$	8
$4\frac{5}{12} = 4\frac{5}{12}$	5
$20\frac{11}{12}$	$\frac{23}{12} = 1\frac{11}{12}$

EXPLANATION. We first find the sum of the fractions $\frac{5}{6}$, $\frac{2}{3}$, and $\frac{5}{12}$. $\frac{5}{6} + \frac{2}{3} + \frac{5}{12}$ changed to equivalent fractions with the least common denominator $= \frac{10}{12} + \frac{8}{12} + \frac{5}{12} = \frac{23}{12} = 1\frac{11}{12}$. Adding the 1 with 4, 8, and 7, we have for the sum $20\frac{11}{12}$. *Ans.* $20\frac{11}{12}$.

1. $5\frac{1}{2} + 2\frac{1}{4} = ?$
2. $10\frac{1}{6} + 12\frac{3}{4} = ?$
3. $8\frac{2}{3} + 9\frac{4}{5} = ?$
4. $9\frac{1}{12} + 5\frac{1}{6} + 15\frac{1}{3} = ?$
5. $7\frac{3}{8} + 9\frac{2}{3} = ?$
6. $20\frac{3}{10} + 14\frac{1}{5} = ?$

302. Illustrative Example. From $8\frac{2}{3}$ take $6\frac{8}{9}$.

Work	
$8\frac{2}{3} = 8\frac{6}{9} = 7\frac{15}{9}$	
$6\frac{8}{9} = 6\frac{8}{9} = 6\frac{8}{9}$	
$1\frac{7}{9}$	

EXPLANATION. We change to equivalent fractions with the least common denominator the fractions $\frac{2}{3}$ and $\frac{8}{9}$, $\frac{2}{3} = \frac{6}{9}$.

Since $\frac{8}{9}$ cannot be taken from $\frac{6}{9}$, we change 1 of the 8 units to 9ths and add it to $\frac{6}{9}$ making $\frac{15}{9}$. $7\frac{15}{9} - 6\frac{8}{9} = 1\frac{7}{9}$. *Ans.* $1\frac{7}{9}$.

Subtract:

1. $13\frac{1}{2} - 5\frac{3}{4}$
2. $12\frac{1}{6} - 10\frac{2}{3}$
3. $7\frac{3}{8} - 9\frac{3}{4}$
4. $12\frac{1}{5} - 9\frac{2}{10}$
5. $38\frac{5}{6} - 24\frac{5}{12}$
6. $18\frac{4}{9} - 11\frac{5}{9}$
7. $9\frac{7}{10} - 5\frac{9}{10}$
8. $33\frac{1}{3} - 26\frac{5}{6}$
9. $25\frac{1}{2} - 13\frac{1}{4} - 2\frac{1}{4}$
10. $29\frac{3}{8} - 9\frac{5}{8} - 8\frac{7}{8}$
11. $35\frac{1}{6} - 15\frac{2}{3} - 7\frac{1}{3}$
12. $46\frac{1}{2} - 20\frac{1}{4} - 14\frac{1}{4}$

13. To make some boxes there were used $2\frac{1}{2}$ pounds of finishing nails, $1\frac{3}{4}$ pounds of brads, and $\frac{5}{8}$ of a pound of gimp tacks. What weight in all was used?

Oral Exercise

303. 1. A grocer bought molasses at $\$\frac{3}{8}$ a gallon and sold it at $\$\frac{1}{2}$ a gallon. How much did he gain on a gallon?

2. An envelope is $6\frac{3}{4}$ in. long and $3\frac{1}{2}$ in. wide. It is how many inches around the edge of the envelope?

3. A girl spent $\frac{1}{3}$ of her money for a book, $\frac{1}{6}$ for a knife, and $\frac{1}{4}$ for fruit. What part of the money was left?

4. If it is $\frac{1}{5}$ of a mile from your home to school and $\frac{1}{2}$ of a mile from your home to the post office, how much farther is it to the post office than to school?

5. One side of a triangle is $\frac{1}{2}$ ft., another is $\frac{1}{3}$ ft., and the other side is $\frac{1}{4}$ ft. What is its perimeter?

Written Exercise

304. 1. $8\frac{2}{3}+15\frac{5}{12}+10\frac{1}{6}=?$

2. $15\frac{1}{2}+73\frac{4}{9}+\frac{5}{6}=?$

3. $14\frac{2}{3}+9\frac{3}{4}+5\frac{1}{2}=?$

4. $27\frac{5}{8}-16\frac{23}{24}=?$

5. A woman bought $12\frac{1}{2}$ yards of ribbon in one piece, $16\frac{5}{8}$ yards in another piece, and $9\frac{3}{4}$ yards in another. How much did she buy in all?

6. A grain dealer bought $236\frac{3}{4}$ bushels of wheat and sold $116\frac{3}{8}$ bushels. How many bushels remained?

7. A owns $\frac{5}{12}$ of a schooner, B owns $\frac{1}{3}$, and C owns as much as A and B together. What part does C own?

8. A peddler's expenses for a day were, for a team $\$2\frac{3}{10}$, keeping it $\$\frac{3}{4}$, and for self $\$1\frac{1}{5}$. Find the sum.

9. After $\frac{1}{8}$ of a class have left, and $\frac{3}{7}$ have been promoted, what part of the class remains?

Oral Exercise

Review pages 148 and 149.

305. Illustrative Example. 5 pieces of ribbon, each $\frac{3}{4}$ of a yard long, are equal to how many yards?

SOLUTION. Since each piece is $\frac{3}{4}$ of a yard, 5 pieces are 5 times $\frac{3}{4}$ of a yard; $5 \times \frac{3}{4}$ yd. $= \frac{15}{4}$ yd. $= 3\frac{3}{4}$ yd.

1. Find the cost of 3 yards of cloth at $\$2\frac{1}{2}$ per yard.

2. Find the cost of 4 spools of silk at $9\frac{1}{2}¢$ a spool.

3. How much will 4 papers of pins cost at $6\frac{1}{4}¢$ a paper?

4. A corn field has $5\frac{1}{8}$ acres; a wheat field has 4 times as many acres. The wheat field is how large?

5. What is the cost of 5 books at $\$1\frac{3}{5}$ each?

6. Find the cost of 8 quarts of berries at $9\frac{1}{2}¢$ a quart.

7. Find the cost of 6 lb. of crackers at $5\frac{1}{2}¢$ a pound.

	a	*b*	*c*	*d*
8.	$5 \times \frac{1}{6} = ?$	$4 \times 3\frac{1}{2} = ?$	$6 \times 6\frac{1}{4} = ?$	$5 \times 9\frac{1}{2} = ?$
9.	$3 \times 2\frac{1}{2} = ?$	$3 \times 3\frac{1}{4} = ?$	$3 \times 9\frac{1}{5} = ?$	$6 \times 8\frac{1}{3} = ?$
10.	$4 \times \frac{2}{5} = ?$	$4 \times 5\frac{1}{3} = ?$	$2 \times 4\frac{1}{2} = ?$	$7 \times 6\frac{1}{4} = ?$
11.	$6 \times 9\frac{1}{7} = ?$	$5 \times 12\frac{1}{2} = ?$	$4 \times 1\frac{1}{3} = ?$	$2 \times 16\frac{2}{3} = ?$

12. If the afternoon session of a school is $2\frac{1}{2}$ hours in length, how many hours are there in 5 afternoon sessions?

13. If one floor board is $3\frac{1}{4}$ inches wide, what is the width of 6 boards?

14. With my thumb and little finger I can span $8\frac{1}{2}$ inches. What will be the total length of 3 spans?

Written Exercise

306. Illustrative Example. Find the cost of 15 lb. of tea at $33\frac{1}{3}¢$ a pound.

WORK

$33\frac{1}{3}¢$
15
5
165
330
$500¢ = \$5.$

EXPLANATION. Since 1 lb. costs $33\frac{1}{3}¢$, 15 lb. will cost 15 times $33\frac{1}{3}¢$; $15 \times \frac{1}{3}¢ = \frac{15}{3}¢ = 5¢$. $5 \times 33¢ = 165¢$, $10 \times 33¢ = 330¢$. Adding, $330¢ + 165¢ + 5¢ = 500¢ = \$5$. 15 lb. will cost \$5. *Ans.* \$5.

1. Find the cost of 16 doz. table covers at $\$18\frac{3}{4}$ per dozen.

2. If the cost of a barrel of flour is $\$5\frac{1}{2}$, what is the cost of 250 barrels?

3. Find the cost of fencing a playground 27 rods long and 18 rods wide at $\$5\frac{1}{4}$ per rod.

4. Find the value of 25 dozen eggs at $28\frac{1}{2}¢$ per dozen.

Multiply as indicated:

5. 6 times $23\frac{1}{4} = ?$ 6. $5 \times 44\frac{2}{3} = ?$ 7. $2 \times 35\frac{3}{4} = ?$ 8. $7 \times 22\frac{3}{8} = ?$

9. There are how many pounds in 18 packages of starch each weighing $2\frac{3}{4}$ pounds?

10. At the rate of $\$2\frac{7}{8}$ per day, how much can a man earn in 12 days?

Find the cost:

11. Of 18 rosebushes at $33\frac{1}{3}¢$ a bush.

12. Of 1 dozen pear trees at $66\frac{2}{3}¢$ apiece.

13. Of 25 lb. of tea at $37\frac{1}{2}¢$ a pound.

Oral Exercise

307. 1. What do you do to find $\frac{3}{4}$ of a number?

2. What is $\frac{1}{4}$ of 16 oz.? $\frac{2}{4}$ of 16 oz.? $\frac{3}{4}$ of 16 oz.?

3. If I divide \$25 into 5 equal parts and give 3 of the parts to Andrew, what part of the \$25 do I give to Andrew? how many dollars? How do you find $\frac{3}{5}$ of \$25?

4. What part of 1 pound is 4 oz.? 8 oz.? 12 oz.? If 1 pound of cheese costs 16¢, how much will 4 oz. cost? 8 oz.? 12 oz.?

5. Find the cost of $\frac{1}{2}$ yd. of 12¢ gingham; of $\frac{1}{4}$ yd.; of $\frac{1}{3}$ yd.; of $\frac{1}{6}$ yd.; of $\frac{3}{4}$ yd.; of $\frac{2}{3}$ yd.; of $\frac{5}{6}$ yd.

6. At 14¢ a quart, find the value of $\frac{2}{7}$ qt.; $\frac{4}{7}$ qt.; $\frac{3}{7}$ qt.; $\frac{5}{7}$ qt.

7. At \$16 per ton, what is the cost of $\frac{1}{2}$ ton of hay? $\frac{1}{8}$ ton? $\frac{3}{8}$ ton? $\frac{5}{8}$ ton? $\frac{3}{4}$ ton?

8. When currants are selling at 10¢ a quart, what is the cost of 1 pt.? of $1\frac{1}{2}$ qt.? of 5 pt.?

9. In 1 peck there are —— quarts. 1 quart is what part of 1 peck? 2 qt. is what part of 1 pk? 3 qt. is what part of 1 pk?

10. When potatoes are worth 40¢ a peck, what is the value of 1 quart? 2 quarts? 3 quarts? 5 quarts?

Find:

	a	*b*	*c*	*d*
11.	$\frac{2}{3}$ of \$9	$\frac{1}{2}$ of 16 yd.	$\frac{5}{6}$ of 18	$\frac{5}{7}$ of 14
12.	$\frac{3}{4}$ of \$16	$\frac{1}{6}$ of 24 bu.	$\frac{3}{10}$ of 40	$\frac{4}{7}$ of 28
13.	$\frac{2}{9}$ of \$18	$\frac{2}{3}$ of 39 bbl.	$\frac{2}{5}$ of 25¢	$\frac{2}{3}$ of 33

[illegible]

[illegible] Illustrative Examples. [illegible]

Work	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

1. [illegible]

2. [illegible] worth [illegible] [illegible]

3. Find the value [illegible]

4. [illegible]

5. [illegible] worth? How much is [illegible] worth?

6. [illegible] acres = [illegible] How many acres [illegible]

7. There are [illegible] cubic inches in [illegible] cubic [illegible] How many cubic inches are there in [illegible] of a cubic [illegible]

Find:

8. [illegible]	22. [illegible]	26. [illegible]
9. [illegible]	23. [illegible]	27. [illegible]
10. [illegible]	24. [illegible]	28. [illegible]
11. [illegible]	25. [illegible]	29. [illegible]

20. Of a wheat field containing 35 acres, [illegible] is plowed on Monday, $\frac{1}{4}$ on Tuesday, and the remainder on Wednesday. How many acres are plowed on each day?

21. A short ton of coal weighs 2000 pounds. A long ton weighs $\frac{3}{25}$ more than the short ton. What is the weight in pounds of the long ton?

Written Exercise

A Grocer's Price List

Apples	pk.	$.40	Eggs	doz.	$.30	Peas	can	$.10
Apricots	can	.25	Flour 25 lb.	sack	.50	Pickles	qt.	.10
Baking powder	½ lb. can	.18	Lemons	doz.	.30	Potatoes	pk.	.20
Bread	loaf	.05	Lettuce	head	.05	Prunes	lb.	.08
Butter	lb.	.26	Lima beans	can	.10	Rice	lb.	.07
Cabbage	lb.	.02	Milk	quart	.06	Rolls	doz.	.10
Cauliflower	head	.15	Oatmeal	pkg.	.10	Salt	lb.	.03
Celery	bunch	.10	Onions	lb.	.02	Soap	bar	.06
Cheese	lb.	.16	Oranges	doz.	.40	Starch	lb.	.10
Coffee	lb.	.35	Peaches	can	.15	Sugar	lb.	.06
Crackers	lb.	.10	Pears	can	.20	Tomatoes	lb.	.03

Find the amount of each of the following orders from the above list:

309. 1. 3 lb. rice, 2 lb. crackers, 4 lb. prunes, ½ bu. potatoes, 1 loaf bread.

2. 2 qt. milk, 1 head lettuce, 1 doz. lemons, 2 sacks flour, 3 doz. eggs, ½ lb. coffee, 8 lb. cabbage.

3. 3½ lb. butter, 1 pkg. oatmeal, 4 lb. tomatoes.

4. 1½ qt. milk, 2 cans peas, 1 can baking powder.

5. 1 lb. starch, ½ doz. eggs, 2 cans pears, 2 bars soap.

6. 6 lb. onions, 1 sack flour, 1½ doz. oranges.

7. ½ pk. potatoes, 2 lb. coffee, ¾ pk. apples.

8. In payment for order 1, how much change will be returned for $2?

9. In payment for order 2, how much change will be returned for $5?

10. Make other orders based upon the above list.

A PROVISION DEALER'S PRICE LIST

Bacon	lb.	$.22	Porterhouse steak	lb.	$.20
Chicken	lb.	.16	Turkey	lb.	.12
Ham	lb.	.17	Veal	lb.	.15
Lard	lb.	.13	Leg of lamb	lb.	.16
Mutton	lb.	.15	Prime rib roast	lb.	.18
Pork	lb.	.12	Rib roast beef	lb.	.12
Round steak	lb.	.15	Short rib roast	lb.	.16
Sirloin steak	lb.	.18	Short steak	lb.	.20

Oral Exercise

310. 1. What is the cost of $2\frac{1}{2}$ lb. sirloin steak?

2. What is the cost of $1\frac{1}{4}$ lb. of pork? of $3\frac{1}{3}$ lb. of veal?

3. What is the cost of a leg of lamb weighing $4\frac{1}{2}$ lb.?

4. Which is cheaper to buy, 3 lb. of prime rib roast, or 3 lb. of porterhouse steak? What is the difference in cost?

5. What is the cost of $4\frac{3}{4}$ lb. of short rib roast?

6. Which is less expensive, two 3-lb. chickens, or an 8-lb. turkey? What is the difference in cost?

7. An 8-lb. strip of bacon costs how much? a 6-lb. turkey?

Written Exercise

311. 1. If I buy an 8-lb. chicken and give a $5 bill in payment, how much change do I receive?

2. What is the cost of a 9-lb. ham? If a $10 bill is given in payment, how much change is returned?

3. Find the cost of 10 lb. of lard and 3 lb. of veal.

4. Make other problems based upon the above price list.

NEW HAVEN, CONN., July 9, 1907.

JAMES W. ROWELL,

DEALER IN FURNITURE, CARPETS, AND DRAPERIES,

Sold to HENRY S. MEARS.

3 Slab mattresses	@	$ 2.00	$ 6 00
6 Basswood chairs	@	.35	2 10
8 Shades	@	.25	2 00
1 Stand			1 25
2 Rockers	@	1.50	3 00
1 Rocker			2 25
1 Kitchen table			2 25
1 Bureau			4 25
1 Mirror			1 25
			$ 24 35

July 15, 1907,
Received payment,
JAMES W. ROWELL.

312. The above is a copy of a bill for goods sold by James W. Rowell of New Haven, Conn., to H. S. Mears on July 9, 1907. The bill was sent by Mr. Rowell to Mr. Mears for payment. Mr. Mears paid for the goods on July 15, 1907. Mr. Rowell acknowledged the payment by returning the bill receipted, that is with the words Received Payment, the date of payment, and his own name written at the bottom of the bill.

Written Exercise

313. 1. Turn to page 170 and make out bills for orders 6 and 7 against John Stowe, dating the bills May 30, 1907.

2. Turn to page 170 and make out in your own name a bill for order 2.

Written Exercise

BRISTOL, MAINE, July 25, 1907.

MR. SAMUEL ELLIS,

Bought of CHARLES A. FARRIN,

DEALER IN DRY GOODS AND GROCERIES.

July	23	½ peck Peas	@	$ .30	
"	24	2 Yeast cakes	@	.02	
		2 lb. Rolled Oats	@	.06	
"	26	2 pkg. Shredded Wheat	@	.13	
		3 gallons Kerosene	@	.15	
		2 lb. Butter	@	.25	
		2 lb. Coffee	@	.35	
		Amount due,			

PORTLAND, OREGON, June 4, 1907.

FRANK H. PENNIMAN

In account with CHARLES H. SEWALL, DR.

June	14	To 6 days' labor	@	$ 3.00	
		To 30 lb. Nails	@	.05	
		To 5 M Shingles	@	3.25	
"	20	To 10 lb. Zinc	@	.15	
"	22	To 12 gal. Paint	@	1.10	
		Amount due,			

314. 1. Copy, find sums due, and receipt the above bills.

2. Make out a bill in due form for goods sold by J. T. Tasker to F. B. Scott as follows: 4 window screens at 40¢ each, 15 window shades at 50¢ each, 2 window shades at 30¢ each. Find the amount due on the bill and receipt it.

Written Exercise

315. Make out receipted bills for the following accounts:

(1) RAYMOND SMITH

In acct. with ALLAN, RAND & Co.

1907			Dr.		Cr.	
Mar.	1	Benzine, 1 can (10 gal.) . . @ 22 ¢	$ 2	20		
Mar.	5	Raw Linseed Oil, 45 gal. . @ 42 ¢	18	90		
		Petroleum, 3 bbl. . . . . @ $7.50	22	50		
			$ 43	60		
Mar.	20	By cash rec'd			$ 40	00
		Balance due	3	60		

(2) THOS. B. JONES

In acct. with C. H. ELIOT.

1907			Dr.		Cr.	
June	7	2 lb. Sirloin Steak . . . . @ 32 ¢				
"	16	2 bu. Potatoes . . . . . @ 75 ¢				
July	1	By cash rec'd in full				

(3) MR. CHAS. P. EMERTON

In acct. with F. D. MARSTERS.

1907.			Dr.		Cr.	
July	3	1 pr. Misses' Rubber Boots	$ 4	00		
		1 pr. Woman's " "	3	00		
		1 pr. Boys' Calf Shoes	2	00		
Aug.	3	By cash paid in full			$ 9	00

NOTE. — The teacher should procure blank billheads from the stationer and have the children use them for making out bills.

Written Exercise

316. Make out accounts and bills for each of the following. Receipt the bills, giving date of payment.

1. March 1, 1907, Smith Thompson bought of Albert Strong & Co. 160 yards gingham at 16¢ a yard, 120 yards flannel at 39¢ a yard, and 140 yards dress goods at 98¢ a yard. The bill was made out March 15, 1907, and paid April 15, 1907.

2. Mr. J. P. Thomas bought of C. H. Ellison, on June 23, 1907, 20 kegs nails at $2.50 per keg, 6 doz. scythes at $9 per doz., and 12 dozen axes at $9 per doz. The bill was made out on June 30, 1907. On July 10, 1907, $100 was paid on the account. Balance was paid Aug. 6, 1907.

3. Mr. S. P. Swazey bought of F. H. Morton & Co., on Sept. 7, 1906, 1500 lb. white lead at $6\frac{1}{2}$¢ a pound, 200 gal. boiled linseed oil at 60¢ per gallon, and 460 rolls of wall paper at 33¢ a roll. The bill was made out on Oct. 1, 1906. On Oct. 16 $200 was paid on account. The balance was paid Dec. 1, 1906. What was the balance?

4. Mr. T. J. Mason bought of Hall & Rowe, on Jan. 6, 1907, 130 lb. coffee at 30¢ a pound, 300 lb. sugar at $4\frac{3}{4}$¢ a pound, 75 lb. starch at 13¢ a pound. The bill was made out Jan. 15, 1907, and paid in full Feb. 1, 1907.

5. Mrs. Frances Oates bought of The Wilson & Barry Company on April 2, 1907, 14 rolls of wall paper at 35¢ a roll, 4 rolls at 42¢, 2 window shades at 39¢ and 4 at 45¢. She paid cash for the goods.

Written Exercise

INDEPENDENT ICE CO.

1907 — PRICES FOR ICE — 1907

WHOLESALE RATES

Less than 500 lb. at one delivery . . .	40¢ per 100 lb.
500 to 1,000 lb. at one delivery . . .	35¢ per 100 lb.
1,000 to 3,000 lb. at one delivery . . .	30¢ per 100 lb.
3,000 to 20,000 lb. at one delivery . . .	25¢ per 100 lb.
20,000 to 40,000 lb. at one delivery . . .	20¢ per 100 lb.

Chipped Ice 25 cents per basket.

Prices subject to change without notice.

317. 1. A dealer who uses 180 lb. of ice per day has an ice bill of how much per week of 6 days?

2. A family consumes 300 lb. of ice per week delivered in 100-lb. pieces. What is the bill for one month of 4 weeks?

3. A wholesale provision dealer consumes 3 tons of ice per week delivered in 1-ton lots. What is his weekly ice bill? What will his bill amount to in 14 weeks?

4. A druggist consumes for his soda fountain 3 baskets of chipped ice daily. During 12 weeks in summer what does his ice supply cost?

5. Make out a bill against S. T. Fields & Co. for 25,000 lb. ice at 20¢ per 100 lb., delivered August 11, 1906.

6. A. F. Blodgett, wholesale dealer, has a bill presented to him Aug. 1, 1907, for ice consumed during the month of July, 1907, for the following amounts: 38,000 lb. at 20¢ per 100 lb., 320 baskets chipped ice at 16¢ per basket. Make out the bill and receipt it for payment Aug. 1, 1907.

Oral Exercise

318. 1. Read the following fractions: $\frac{1}{10}$, $\frac{5}{10}$, $\frac{4}{100}$, $\frac{6}{100}$, $\frac{9}{1000}$.

2. In each of the above fractions name the numerator. Name the denominator.

Notice that each of these fractions has for its denominator either 10 or a number made by using only 10's as factors. Thus $100 = 10 \times 10$; $1000 = 10 \times 10 \times 10$.

319. There is a shorter way of writing fractions having 10, 100, 1000, etc. for a denominator. Thus, we write .1 for $\frac{1}{10}$, .04 for $\frac{4}{100}$, .009 for $\frac{9}{1000}$.

320. A fraction whose denominator is either 10 or a number made by using only 10's as factors is called a **decimal fraction** or a **decimal**.

NOTE. — The term *decimal* usually indicates the fraction when expressed in the shorter way, with the decimal point instead of with the written denominator.

321. Fractions written with denominators, as $\frac{1}{5}$, $\frac{3}{4}$, $\frac{8}{100}$, $\frac{7}{8}$, are called **common fractions**.

3. Tell from the above in which place from the **decimal point** to write 1 tenth, 1 hundredth, 1 thousandth.

4. Write in the short way $\frac{5}{10}$, $\frac{24}{100}$, $\frac{7}{100}$, $\frac{12}{1000}$.

5. Read .7, .9, $\frac{4}{10}$, .06, .14, .29, $\frac{17}{100}$, .038, .0009, .203.

Write both as common fractions and as decimals:

6. Nine tenths, fifteen hundredths, 6 tenths, 6 hundredths, 6 thousandths.

7. 77 thousandths, 245 thousandths, 21 thousandths, 5 thousandths, 11 thousandths, 111 thousandths.

Oral and Written Exercise

322. Read these decimals:

	a	*b*	*c*	*d*	*e*	*f*
1.	.7	.1	.002	.19	.011	.03
2.	.04	.08	.016	.36	.01	.383

3. How many figures are required to express tenths? hundredths? thousandths?

4. Read the mixed numbers $1\frac{1}{10}$; $1\frac{5}{100}$; $4\frac{75}{100}$; $11\frac{84}{1000}$.

We may write 1.1 for $1\frac{1}{10}$; 1.05 for $1\frac{5}{100}$; 4.75 for $4\frac{75}{100}$; 11.084 for $11\frac{84}{1000}$.

323. In reading a whole number with a decimal the word *and* is always used between the whole number and the decimal.

5. Read the mixed decimals 3.4; 6.05; 20.81; 230.801; 56.057.

Write, using the decimal point:

g	*h*
6. 2 and 3 tenths	9. 73 and 33 thousandths
7. 6 and 41 hundredths	10. 517 and 764 thousandths
8. 4 and 59 hundredths	11. 512 and 7 hundredths

Read the following decimals:

i	*j*	*k*	*l*
12. .67	17. 12.14	22. 301.201	27. 36.752
13. .761	18. 8.044	23. 110.91	28. 8.16
14. .9	19. .005	24. 2.001	29. 48.33
15. .14	20. 36.01	25. 7.56	30. 5.11
16. .387	21. 16.63	26. .952	31. .111

Written Exercise

324. Write as common fractions:

	a	*b*	*c*	*d*	*e*	*f*	*g*
1.	.4	.35	.54	.68	.35	.20	.04
2.	.2	.15	.32	.53	.8	.76	.023

325. Illustrative Example. Change to common fractions in their lowest terms: (1) .08; (2) .35; (3) .555.

SOLUTION. (1) $.8 = \frac{8 \div 2}{10 \div 2} = \frac{4}{5}$. (2) $35 = \frac{35 \div 5}{100 \div 5} = \frac{7}{20}$.

(3) $.555 = \frac{555 \div 5}{1000 \div 5} = \frac{111}{200}$.

Change to common fractions in their lowest terms:

	h	*i*	*j*	*k*	*l*	*m*	*n*
3.	.6	.200	.06	.005	.350	.125	.25
4.	.66	.84	.068	.020	.75	.30	.850

326. Ill. Example. Change to decimals: (1) $\frac{3}{5}$; (2) $\frac{15}{20}$.

WORK. (1) $\frac{3}{5} \times \frac{2}{2} = \frac{6}{10} = .6$. (2) $\frac{15}{20} \times \frac{5}{5} = \frac{75}{100} = .75$.

Change the following to decimals:

		o	*p*	*q*	*r*	*s*	*t*
To tenths:	5.	$\frac{1}{2}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{15}{30}$	$\frac{27}{30}$	$\frac{35}{30}$
	6.	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{10}{20}$	$\frac{21}{30}$	$\frac{12}{60}$	$\frac{36}{40}$
To hundredths:	7.	$\frac{1}{2}$	$\frac{2}{4}$	$\frac{3}{4}$	$\frac{30}{50}$	$\frac{4}{25}$	$\frac{28}{200}$
	8.	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{7}{20}$	$\frac{10}{20}$
To thousandths:	9.	$\frac{1}{2}$	$\frac{1}{5}$	$\frac{5}{20}$	$\frac{6}{50}$	$\frac{11}{100}$	$\frac{4}{200}$
	10.	$\frac{1}{4}$	$\frac{1}{10}$	$\frac{10}{20}$	$\frac{60}{500}$	$\frac{11}{200}$	$\frac{11}{500}$

Written Exercise

327. Ill. Ex. Find the sum of 8.1, 2.16, and 56.275.

WORK

$$\begin{array}{r} 8.1 \\ 2.16 \\ 56.275 \\ \hline 66.535 \end{array}$$

EXPLANATION. We write the given numbers so that tenths shall all stand in the tenths' column, hundredths in the hundredths' column, and thousandths in the thousandths' column. We add as in whole numbers, and place the decimal point in the sum between the ones and the tenths.

Ans. 66.535.

Write in columns and add:

1. 321.06 + 508.7 + 0.675 + 0.045 + 557.6
2. 58.469 + 0.845 + 12.5 + 8.91 + 15.59
3. 124.015 + 53.481 + 41.157 + 5.2 + 2.715
4. 90.996 + 409.11 + 8.59 + 670.704 + 49.16
5. 46.485 + 700.563 + 57.811 + 92.398 + 81.3
6. 36.596 + 111.57 + 8.97 + 55.84 + 3.491

7. 9 and 7 tenths, 76 and 8 tenths, 5 and 43 hundredths, and 24 and 9 hundredths.

8. 8 and 73 hundredths, 9 and 3 tenths, 67 and 34 hundredths, and 8 and 9 hundredths.

9. 7 and 29 hundredths, 46 and 7 tenths, 39 hundredths, 20 and 5 thousandths, and 7 tenths.

10. 5 and 236 thousandths, 18 and 37 thousandths, 246 and 21 hundredths, 581 thousandths, and 4 and 309 thousandths.

11. 1 and 326 thousandths, 648 and 25 hundredths, 37 and 98 hundredths, and 16 and 54 thousandths.

Written Exercise

328. Illustrative Example. From 14.075 take 9.012.

Work
14.075
9.012
5.063

Explanation. We write the numbers as in addition, subtract as in whole numbers, and place the decimal point in the remainder between the ones and the tenths.

Ans. 5.063.

Write in columns and subtract:

1. 87.08 − 26.09
2. 48.03 − 32.1
3. 19.012 − 8.016
4. 1 − .095
5. 10 − 2.083
6. 56.735 − 20.87
7. 34.16 − 25.006
8. 32.05 − 1.145
9. 38.667 − 17.125
10. 7.65 − 5.56
11. 78.243 − 66.01
12. 61.43 − 7.733

13. From 14 and 5 tenths take 75 hundredths.
14. From 7 and 43 hundredths take 647 thousandths.
15. Subtract 66 thousandths from 6 and 6 tenths.
16. Find the difference between 16 and 16 thousandths.
17. From 40.7 rods take 5.25 rods.
18. From 10 subtract .1.
19. 1 − .426 = ?
20. From 91 and 7 hundredths take 13.102.
21. The British Imperial bushel contains 2218.2 cubic inches. The United States Standard bushel contains 2150.42 cubic inches. In the British Imperial bushel there are how many more cubic inches than in the United States bushel?

Written Exercise

329. Ill. Ex. Multiply (1) 1.342 by 5; (2) 1.342 by .5.

Work

(1) 1.342
5
6.710

(2) 1.342
.5
.6710

Explanation. (1) 5 times 1.342 = 6.710. (2) To multiply 1.342 by .5 we take .5 of 1.342; .1 of 1.342 is expressed by moving the decimal point one place to the left, thus, .1342; .5 of 1.342 is 5 times .1342 = .6710.

Ans. .6710.

To multiply by a decimal, multiply the numbers as if the numbers were whole numbers and point off as many decimal places in the product as there are decimal places in the multiplier and multiplicand together.

1. Multiply 0.44 by 9; 0.044 by 9; 0.01604 by 9.

2. Multiply 1.2 by 12; 0.12 by .12; 0.024 by .12.

3. Multiply 37.5 by .15; 6.25 by .05; 87.5 by 20.

4. There are 16.5 feet in 1 rod. How many feet are there in a mile, or 320 rods?

5. How many feet are there in .5 of a rod?

6. There are 30.25 square yards in a square rod. How many square yards are there in 160 square rods, or an acre?

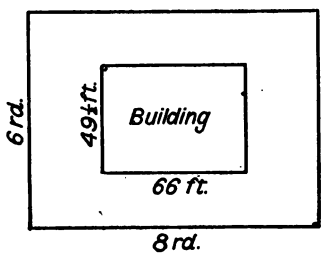
7. At 0.3¢ per pound, what is the cost of the following lots of ice: 357 lb., 900 lb., and 465 lb.?

8. I have 3.75 yards of binding for a square bedspread 2.25 yd. on each side. How much more binding do I need?

9. If there are 272.25 sq. ft. in 1 square rod, how many sq. ft. equal 150 square rods?

Written Exercise

330. 1. This plan represents a plot of ground 8 rd. long and 6 rd. wide. The plot contains how many square rods?



2. The plot is how many feet long? It is how many feet wide? It contains how many square feet?

3. How many square feet are covered by the building?

4. Find the difference (in square feet) between the area of the plot and the area covered by the building.

5. What is the difference in feet between the length of the building and the length of the plot? What is the difference between the width of the plot and the width of the building?

6. The building stands exactly in the center of the plot. There are how many feet between the side of the building and the side of the plot? What is the distance between the end of the plot and the end of the building?

7. How much will it cost for 8 rods of concrete walk along one side of the plot, the width to be 6 feet and the cost 85¢ per square yard?

8. How much will it cost to fence the plot at a cost of 50¢ per running foot?

9. In 1 cubic yard there are how many cubic feet? in 36.45 cubic yards? in 6.3 cubic yards?

Oral Exercise

331. 1. Repeat the table of linear measure, page 143.

2. What is the combined length of two sticks of timber, one 12 ft. 4 in. long, and the other 6 ft. 6 in. long?

3. To make two shelves, one 3 ft. 4 in. long and 10 in. wide, the other 4 ft. 6 in. long and 10 in. wide, will require how long a board 10 in. wide?

Written Exercise

332. 1. In 212 feet there are how many yards and feet?

SOLUTION. There are 3 ft. in 1 yd. In 212 ft. there are as many yards as 3 ft. are contained times in 212 ft. 212 ft. ÷ 3 ft. = 70, the number of yards, with 2 ft. remainder. *Ans.* 70 yd. 2 ft.

2. There are how many rods in 110 yards? in 220 yards?

3. In 62 yards there are how many feet?

333. Illustrative Example. Add 60 ft. 4 in.; 37 ft. 3 in.; 12 ft. 5 in.; 18 ft. 6 in.

WORK

60 ft. 4 in.
37 ft. 3 in.
12 ft. 5 in.
18 ft. 6 in.
128 ft. 6 in.

EXPLANATION. We write the number so that units of the same denomination stand in the same column. We add first the inches, thus, 6, 11, 14, 18 in. 18 in. = 1 ft. 6 in. We write 6 for the inches in the sum and reserve the 1 ft. The 1 ft. reserved + 18 ft. + 12 ft. + 37 ft. + 60 ft. = 128 ft. We write 128 for the feet in the sum.

Ans. 128 ft. 6 in.

Written Exercise

334. 1. Add 14 rd. 11 ft. 6 in.; 11 rd. 6 ft. 4 in.

2. Add 24 yd. 2 ft.; 74 yd. 1 ft.; 46 yd. 1 ft.

3. Add 4 rd. 3 yd. 6 ft.; 6 rd. 5 yd. 2 ft.; 5 rd. 1 yd. 2 ft.

Review the table of square measure, page 150.

4. Add 14 A. 40 sq. rd.; 11 A. 65 sq. rd.; 130 A. 45 sq. rd.

5. Add 24 sq. yd. 5 sq. ft.; 15 sq. yd. 4 sq. ft; 9 sq. ft.

335. Illustrative Example. From 70 sq. ft. 48. sq. in. take 50 sq. ft. 56 sq. in.

WORK

(69) (192)
70 sq. ft. 48 sq. in.
50 sq. ft. 56 sq. in.
19 sq. ft. 136 sq. in.

EXPLANATION. Write the numbers as in addition with units of the same denomination in the same column. From 48 sq. in. 56 sq. in. cannot be taken. Take 1 of the 70 sq. ft. (leaving 69 sq. ft.), change this sq. ft. to sq. in.; 144 sq. in. + 48 sq. in. = 192 sq. in.; 192 sq. in. − 56 sq. in. = 136 sq. in. 69 sq. ft. − 50 sq. ft. = 19 sq. ft. *Ans.* 19 sq. ft. 136 sq. in.

6. From 16 sq. rd. 15 sq. yd. take 8 sq. rd. 6 sq. yd.

7. From 13 ft. 9 in. take 6 ft. 5 in.

8. From 68 yd. 3 ft. 11 in. take 31 yd. 2 ft. 9 in.

9. From 18 rd. 5 yd. 1 ft. take 14 rd. 3 yd. 2 ft.

Review the table of cubic measure, page 151.

10. Add 6 cu. yd. 2 cu. ft. 25 cu. in.; 4 cu. yd. 6 cu. ft. 175 cu. in.; 9 cu. yd. 8 cu. ft. 210 cu. in.

Oral Exercise

336. 1. A meadow 1 mile square is how many feet long?

2. How many square yards of roofing paper will be needed to cover 2 roofs, one containing 11 square yards, 3 square feet, the other 10 square yards, 6 square feet?

Repeat the table of liquid measure, page 108; of dry measure, page 109; of weight, page 105.

3. How many pint jars can be filled from 8 gallons?

4. How many 40-gallon casks will hold 400 gallons?

5. $\frac{1}{4}$ of 80 quarts equals how many gallons?

6. In 16 pecks there are how many bushels?

7. In 4 pecks there are how many quarts?

8. How many quarts make 1 bushel? 2 bushels?

9. How many pecks are there in 8 bushels? in 10 bushels?

10. At 60¢ a bushel what is the price of a peck of corn? What is the price of $2\frac{1}{2}$ bushels of corn?

11. What is $\frac{1}{3}$ of 36 bushels? $\frac{2}{3}$ of 36 bushels?

12. What is $\frac{1}{5}$ of 20 quarts? $\frac{3}{5}$ of 20 quarts?

13. How many pints of berries can be bought for \$1 when 10 quarts can be bought for \$2?

14. A keg of nails weighs 100 lb. What part of the keg weighs 50 lb.? 25 lb.? 75 lb.? 20 lb.? 40 lb.?

15. If a cubic foot of water weighs 1000 ounces, $\frac{3}{5}$ of a cubic foot will weigh how many ounces?

16. How many 500-lb. bales of cotton weigh 1 ton?

Written Exercise

337. 1. If it takes 40 quarts of grass seed to sow 1 acre of land, how many acres will 12.5 bushels of seed sow?

2. A 10-acre field yielded 303 bushels of grain. What was the average yield per acre?

3. Of a 160-acre farm .25 is a corn field, .125 is grassland, .125 is an oat field. 5 acres are given up for the buildings and lawns, and the remainder is pasture land. Find the number of acres in each plot.

4. Which is the more profitable crop on a 30-acre field, wheat yielding 24 bushels to the acre at 65¢ a bushel, or corn yielding 43 bushels to the acre at 25¢ per bushel? How much more profitable?

5. A 15-acre field yielded $2\frac{1}{2}$ tons of hay to the acre. The hay sold for \$14 per ton. If it cost an average of \$3.50 per ton to raise, harvest, and market the hay, what was the total profit?

Written Exercise

338. Illustrative Example. Multiply 7 gal. 3 qt. 1 pt. by 4.

WORK

7 gal. 3 qt. 1 pt.
4
31 gal. 2 qt. 0 pt.

EXPLANATION: We multiply the units of each denomination separately, beginning with the lowest.

4×1 pt. $= 4$ pt. $= 2$ qt. 0 pt. We write 0 for no pints in the product, and reserve the 2 qt. 4×3 qt. $= 12$ qt.; 12 qt. with the 2 qt. reserved $= 14$ qt. 14 qt. $= 3$ gal. 2 qt. We write 2 for qt. in the product, and reserve the 3 gal. 4×7 gal. $= 28$ gal.; 28 gal. with the 3 gal. reserved $= 31$ gal. We write 31 gal. in the product.

Ans. 31 gal. 2 qt. 0 pt.

Multiply:

1. 1 bbl. 4 gal. 1 qt. by 6
2. 7 cu. yd. 11 cu. ft. by 8
3. 5 sq ft. 21 sq. in by 12
4. 12 A. 8 sq. rd. by 5
5. 12 ft. 8 in. by 5
6. 6 yd. 2 ft. 4 in. by $4\frac{1}{2}$

339. Illustrative Example. What is $\frac{1}{3}$ of 2 bu. 3 pk. 5 qt.

WORK

3 pk. 7 qt.
3)2 bu. 3 pk. 5 qt.

EXPLANATION. We divide the units of each denomination separately, beginning with the highest.

Since $\frac{1}{3}$ of 2 bu. gives no whole number of bushels, we change 2 bushels to pecks. 2 bu. $= 8$ pk.; 8 pk. $+ 3$ pk. $= 11$ pk. $\frac{1}{3}$ of 11 pk. $= 3$ pk. with 2 pk. over. We write 3 for the pecks in the quotient. The 2 pk. over with the 5 qt. $= 21$ qt. $\frac{1}{3}$ of 21 qt. $=$ 7 qt. We write 7 for the quarts in the quotient.

Ans. 3 pk. 7 qt.

Written Exercise

340. 1. Find the combined weight of 2 stacks of hay containing 4 T. 15 cwt. 4 lb. and 3 T. 4 cwt. 46 lb.

2. Add:

6 cu. yd.	2 cu. ft.	25 cu. in.
11 cu. yd.	6 cu. ft.	290 cu. in.
16 cu. yd.	15 cu. ft.	350 cu. in.

3. A cellar is excavated 40 feet long, 28 feet wide, 11 feet deep. How much does the excavation cost at $1.50 per cubic yard?

4. A pile of wood contains 384 cubic feet. How many cords are there in the pile?

5. From 28 cubic yards, 5 cubic feet, 875 cubic inches, take 10 cubic yards, 19 cubic feet, 562 cubic inches.

6. How much does 1 peck of wheat weigh if 10 bushels weigh 600 lb.?

7. What is the weight of 9 loads of oats, each load containing 40 bushels weighing 32 pounds each?

8. Divide 15 cwt. 90 lb. by 5; 82 lb. 12 oz. by 4.

9. From 2 T. 5 cwt. 13 lb. take 1 T. 11 cwt. 8 lb.

10. How much water does a pipe discharge in 20 minutes, if it discharges $12\frac{1}{2}$ gal. a minute?

11. If 1 gallon contains 231 cubic inches, in 6930 cu. in. there are how many gallons?

Review the table of time measure, page 77.

12. Add 4 yr. 9 mo. 20 da., 6 yr. 4 mo. 10 da.

13. From 4 da. 12 hr. 45 min. take 1 da. 15 hr. 20 min.

Oral Exercise

341. 1. How many hours are there in 1 day? in $\frac{1}{6}$ of a day? in $\frac{3}{8}$ of a day? in $\frac{3}{4}$ of a day?

2. In 5 weeks there are how many days?

3. How many months are there in $\frac{3}{4}$ of a year? in $\frac{1}{2}$ year?

Written Exercise

342. Add:

1. 12 da. 6 hr. 40 min.
   18 da. 10 hr. 20 min.

2. 3 hr. 10 min. 45 sec.
   6 hr. 10 min. 40 sec.

Subtract:

3. 8 yr. 4 mo. 6 da.
   5 yr. 9 mo. 1 da.

4. 8 yr. 7 mo. 15 da.
   4 yr. 9 mo. 20 da.

Subtract:

5. 14 da. 11 hr. 15 min.
   4 da. 9 hr. 20 min.

6. 9 yr. 6 mo. 12 da.
   5 yr. 8 mo. 6 da.

343. Illustrative Example. Find the time from Jan. 6, 1895, to Dec. 15, 1905.

NOTE. January is the 1st month, December is the 12th month.

Dec. 15, 1905	1905 yr. 12 mo. 15 da.
Jan. 1, 1895	1895 yr. 1 mo. 6 da.
	10 yr. 11 mo. 9 da.

7. Find the time from Jan. 2, 1875, to Dec. 20, 1902.

8. Find the time from July 10, 1904, to Jan. 30, 1906.

9. Find the time from Feb. 12, 1900, to May 15, 1907.

10. Find the time from Aug. 11, 1899, to July 24, 1908.

Written Exercise

344. 1. What is the value of a 6000-ton cargo of iron at a price of $2.50 per ton?

2. The first iron foundry in Massachusetts was established at Lynn in 1643. That was how many years ago?

3. Father Hennepin discovered the first coal land in what is now the state of Illinois, in 1679. How many years have elapsed since then?

4. In a single year 725,645 ounces of gold were used in the arts and industries in the United States. At $20.67 per ounce, what was its total value?

5. In 1900 the United States produced 74,500,000 ounces of silver. What was the total value at 50¢ an ounce?

6. What is the value of the pure gold, at $ 20.67 per ounce, in 20 ounces of gold coins, if .9 of the weight is pure gold?

7. What is the weight of the pure gold in 500 ounces of English gold coin, if .916⅔ of its weight is pure gold?

8. In one year the output of copper in the United States was 170,000 tons. Find its total value at 16¢ per lb.

9. How many tons of zinc ore at $48 per ton would have a value of $253,788?

10. The lead mines of Joplin, Missouri, produced, in the year ending Jan. 12, 1907, 1,336,730 lb. of lead. At 50¢ per pound, what was its total value?

11. Find the value of 48 tons of steel at $30.50 per ton plus freight at $12.50 per ton.

Written Exercise

345. 1. Find the number of cubic inches contained in a box having an inside measure of 11 in. by 7 in. by 3 in.

2. There are how many cubic inches in 1 cubic foot? how many gallons? (231 cu. in. = 1 gal.)

3. How many cords of wood are there in a pile 16 ft. by 4 ft. by 4 ft.?

There are how many cords in each of the piles of wood measuring as follows?

4. 24 ft. by 8 ft. by 4 ft.
5. 48 ft. by 4 ft. by 6 ft.
6. 40 ft. by 8 ft. by 8 ft.
7. 16 ft. by 8 ft. by 4 ft.
8. 4 ft. by 4 ft. by 4 ft.
9. 8 ft. by 8 ft. by 6 ft.

10. I received 4 loads of coal weighing as follows:

1st load, 2 T. 560 lb.; 2d load, 2 T. 355 lb.; 3d load, 3 T.; 4th load, 2 T. 1985 lb. What was the total weight and the cost at $7.25 per ton?

11. If 10 tons of coal will heat Mr. B's house for 6 winter months, what is the average consumption per month and its cost per month at $7.25 per ton?

12. Find $\frac{1}{8}$ of 25 ft. 4 in.; $\frac{1}{8}$ of 18 ft. 6 in.; $\frac{1}{8}$ of 62 ft. 2 in.

13. Find $\frac{1}{8}$ of 20 in.; $\frac{1}{4}$ of $\frac{1}{2}$ in.; $\frac{1}{2}$ of $\frac{1}{4}$ in.

14. If an 8-ounce jar contains 1 pint, how many quarts are there in a 64-ounce jar?

15. There are how many feet in 3 rods? in 8 rods?

16. What is the cost of 13,500 shingles at $3.25 per thousand?

Written Exercise

346. 1. Make a drawing of a table top 2 ft. by 4 ft. on a scale of $\frac{1}{2}$ inch to the foot. How long is the figure? How wide is it?

2. Make a drawing of the floor plan of a rectangular room, 12 ft. by 18 ft., on a scale of $\frac{1}{8}$ of an inch to the foot. How long is the figure? How wide is it?

3. If a cork tree yields 2000 lb. of cork every 4 years, how many tons will it yield in 48 years?

4. What is the cost of concreting a basement floor 60 feet long and 30 feet wide at 65¢ per square yard?

5. What is the expense for a plank walk 500 feet long and 8 feet wide at 16¢ per square foot?

6. Double and halve the following recipe for oyster soup:

1 pint oysters
$\frac{1}{2}$ pint milk
$\frac{1}{2}$ tablespoonful butter.
1 tablespoonful flour
$\frac{1}{4}$ saltspoonful pepper

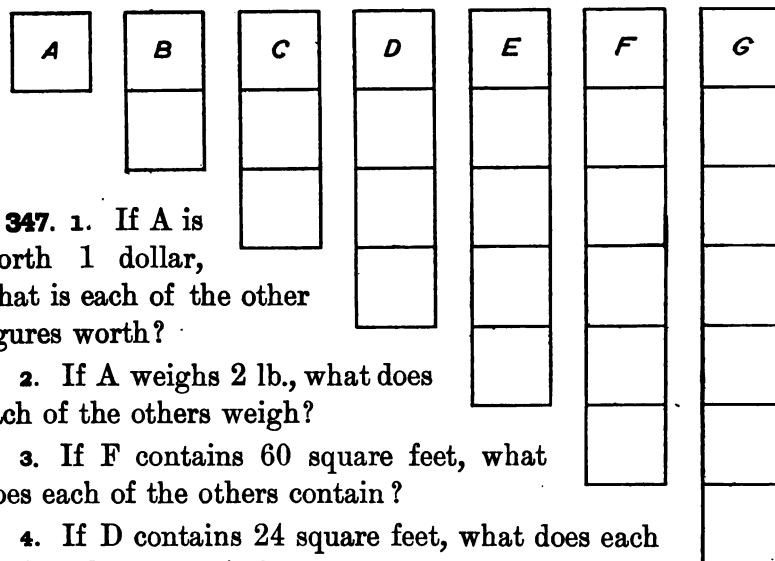
7. The daily temperature averages for a certain city were as follows for one week:

Monday	75 degrees	Thursday	70 degrees
Tuesday	78 degrees	Friday	71 degrees
Wednesday	68 degrees	Saturday	63 degrees
		Sunday	82 degrees

What was the average temperature for the week?

8. Find the average height of 6 boys measuring as follows: 5 ft. 1 in.; 4 ft. 11 in.; 5 ft.; 4 ft. 9 in.; 4 ft. 8 in.; 4 ft. 10 in.

Oral Exercise



347. 1. If A is worth 1 dollar, what is each of the other figures worth?

2. If A weighs 2 lb., what does each of the others weigh?

3. If F contains 60 square feet, what does each of the others contain?

4. If D contains 24 square feet, what does each of the others contain?

5. If A is $\frac{1}{3}$ of a lb., what is each of the others?

6. If E is 10 ounces, what is each of the others?

7. If E is worth \$1000, how much is each of the others worth?

8. If D is 1 bushel, what is each of the others?

9. If D is 1 gallon, how many quarts is G?

10. If F is 1 hour, how many minutes is A? B? G?

11. If D is \$100, how many dollars is each of the others?

12. If A is 2 pk., how many bushels is D? B? C?

13. If A is a floor 10 feet square, B is a floor of what dimensions? C is of what area? E is of what area?

Written and Oral Exercise

348. 1. Multiply $12\frac{1}{2}$ by 8. $12\frac{1}{2}$ is what part of 100? $12\frac{1}{2}¢$ is what part of \$1 (100¢)? $\frac{1}{8}$ of 100 = what? What is $\frac{2}{8}$ of 100? What is $\frac{3}{8}$ of 100?

2. Multiply 25 by 4. 25 is what part of 100? 25¢ is what part of \$1? 50¢ is what part of \$1? 75¢ is what part of \$1? What part of \$1 is 30¢? 80¢?

3. Multiply $8\frac{1}{3}$ by 12. $8\frac{1}{3}$ is what part of 100? $8\frac{1}{3}¢$ is what part of \$1? What is $\frac{1}{12}$ of 100? $\frac{3}{12}$ of 100? What is $\frac{5}{12}$ of 100? What is $\frac{7}{12}$ of 100?

4. Multiply $16\frac{2}{3}$ by 6. $16\frac{2}{3}$ is what part of 100? $16\frac{2}{3}¢$ is what part of \$1? What is $\frac{1}{6}$ of 100? $\frac{2}{6}$ of 100? $\frac{3}{6}$ of 100? What is $\frac{5}{6}$ of 100?

5. $33\frac{1}{3} \times 3 = ?$ $33\frac{1}{3}$ is what part of 100? $33\frac{1}{3}¢$ is what part of \$1? $\frac{1}{3}$ of 100 = ? $\frac{2}{3}$ of 100 = ?

6. At $33\frac{1}{3}¢$ an hour, how many hours will it take a man to earn \$1?

7. At $12\frac{1}{2}¢$ a yard, how many yards of ribbon can be bought for 25¢? for $37\frac{1}{2}¢$? for 50¢? for $62\frac{1}{2}¢$? for 75¢? for $87\frac{1}{2}¢$? for \$1?

8. If 3 lb. of coffee sell for \$1, what is the price of 1 lb?

9. If 6 quarts of cherries are worth \$1, how much is 1 quart worth? At the same rate how much are 2 quarts worth? 3 quarts? 5 quarts?

10. 20 is what part of 100? $\frac{2}{5}$ of 100 = ? $\frac{3}{5}$ of 100 = ? $\frac{4}{5}$ of 100 = ?

Written Exercise

RECEIPTS OF LIVESTOCK AT THE YARDS NEAR BOSTON FOR THE WEEK ENDING JULY 24, 1906

	CATTLE	SHEEP	CALVES	SWINE
BRIGHTON				
Maine	119	....	337	226
New Hampshire	63	....	2270	24
Massachusetts	199	36	204	33
Western	870	....	....	....
New York	20	....	....	....
Vermont	97	26	175	....
WATERTOWN				
Maine	100	....	130	22
New Hampshire	79	....	160	....
Vermont	23	75	130	74
Massachusetts	65	20	205	10
SOMERVILLE				
Maine	7	86	270	....
New Hampshire	10	25	364	....
Vermont	63	150	474	....
Massachusetts	....	....	5	38
Western	1255	5237	....	23,582
Totals				

349. **1.** Find the total of all cattle received at each of the three yards.

2. Find the total number for all the yards.

3. Find the total number of sheep received at each of the three yards.

4. Find the total number of sheep received at all the yards.

5. Find the total number of calves received at each of the three yards.

6. Find the total number of calves received at all the yards.

7. Find the grand total of swine received.

8. The total receipts of the week before were as follows: cattle, 3637; sheep, 7043; calves, 2450; swine, 23,928.

Find the difference in the total receipts of the two weeks.

9. If the sheep received in the week ending July 24, 1906, had the average weight of 30 lb. each, how much did they all weigh? How many tons?

Oral and Written Exercise

350. 1. What part of 1 yd. is 1 ft.? 2 ft.? 4 ft.? 6 ft.?

2. In $\frac{1}{3}$ of a square yard there are how many square feet? in $\frac{2}{3}$ of a square yard? in $1\frac{1}{3}$ sq. yd.?

3. There are how many quarts in $\frac{1}{2}$ of 3 gal.? There are how many pints in $\frac{1}{4}$ of 1 gal.?

4. What is $\frac{1}{2}$ of 25¢? $12\frac{1}{2}$¢ is contained in 25¢ how many times? in 50¢? in 75¢? in \$1? $12\frac{1}{2}$¢ is what part of \$1?

5. How many hundredths of \$1 are 5¢? 25¢? 75¢?

6. How many hundredths of 1 ton are 1000 lb.? 500 lb.?

7. How many hundredths of 1 da. are 6 hr.? 18 hr.?

8. How many pounds are $\frac{1}{100}$ of 500 lb.? $\frac{25}{100}$? $\frac{50}{100}$?

9. How many pounds are .06 of 500 lb.? .03 of 500 lb.?

10. A man is paid for taking a census of school children at the rate of \$5 for 100 names. How much does he receive for 600 names? for 800 names? for 1000 names?

11. Find the cost of 500 lb. of smoked fish at 19¢ per pound. What is the rate or price per hundred pounds?

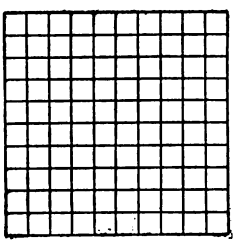
12. A real estate agent sells a piece of land for \$900. At the rate of \$3 per \$100 received for the land, how much does he receive for selling it?

13. A newsboy makes a profit of $\frac{1}{2}$¢ on each paper he sells. At that rate, what is his profit on 300 papers?

14. Find the value of all the cattle (example 1, page 196) sold during the week ending July 24, 1906, at 8¢ a pound, their average weight being 674 lb.

Oral Exercise

351. It is common to speak of $\frac{1}{100}$, or .01, of any thing as 1 **per cent** of it. Any number of per cents of any thing or any quantity always means that number of hundredths of the thing or quantity, and the thing or quantity referred to is to be thought of as divided into 100 equal parts.



This square has been divided into 100 smaller squares. Each smaller square is $\frac{1}{100}$ (.01) or 1 per cent of the larger square. We write 1 per cent thus, 1%.

1. What per cent of the larger square are 2 of the small squares? 3 small squares are what per cent of the large square?

2. $\frac{1}{10}$ (or .1) of the large square equals how many small squares? .1 (or $\frac{1}{10}$) of the large square is equal to what per cent of it?

3. $\frac{1}{2}$ (or .5) of the large square is equal to how many of the small squares? $\frac{1}{2}$ equals what % of the large square?

Supply the missing numbers in the following:

4. $\frac{1}{2} = \frac{\quad}{100} =$ ——— %
5. $\frac{1}{4} = \frac{\quad}{100} =$ ——— %
6. $\frac{1}{10} = \frac{\quad}{100} =$ ——— %
7. $\frac{5}{10} = \frac{\quad}{100} =$ ——— %
8. $\frac{1}{20} = \frac{\quad}{100} =$ ——— %
9. $\frac{1}{25} = \frac{\quad}{100} =$ ——— %
10. $\frac{10}{50} = \frac{\quad}{100} =$ ——— %
11. $\frac{1}{5} = \frac{\quad}{100} =$ ——— %
12. $\frac{3}{4} = \frac{\quad}{100} =$ ——— %
13. $\frac{3}{10} = \frac{\quad}{100} =$ ——— %
14. $\frac{6}{10} = \frac{\quad}{100} =$ ——— %
15. $\frac{5}{20} = \frac{\quad}{100} =$ ——— %
16. $\frac{5}{25} = \frac{\quad}{100} =$ ——— %
17. $\frac{20}{50} = \frac{\quad}{100} =$ ——— %

Oral Exercise

352.

1. 50 % means $\frac{50}{100}$;
   $\frac{50}{100} = \frac{1}{2}$;
   50 % of a number = $\frac{1}{2}$ of the number.
   50 % of \$4 = ——

2. 25 % means $\frac{25}{100}$;
   $\frac{25}{100} = \frac{1}{4}$;
   25 % of a number = $\frac{1}{4}$ of the number.
   25 % of 16 apples = ——

3. $3 \times 33\frac{1}{3} = 100$;
   $33\frac{1}{3}$ % means $\frac{33\frac{1}{3}}{100} = \frac{1}{3}$;
   $33\frac{1}{3}$ % of a number = $\frac{1}{3}$ of the number.
   $33\frac{1}{3}$ % of \$12 = ——

4. $6 \times 16\frac{2}{3} =$ ——;
   $16\frac{2}{3}$ % means $\frac{16\frac{2}{3}}{100} = \frac{1}{6}$;
   $16\frac{2}{3}$ % of a number = $\frac{1}{6}$ of the number.
   $16\frac{2}{3}$ % of 30¢ = ——

5. $8 \times 12\frac{1}{2} =$ ——
   $12\frac{1}{2}$ % means $\frac{12\frac{1}{2}}{100} = \frac{1}{8}$;
   $12\frac{1}{2}$ % of a number = $\frac{1}{8}$ of the number.
   $12\frac{1}{2}$ % of \$24 = ——

6. $12 \times 8\frac{1}{3} =$ ——
   $8\frac{1}{3}$ % means $\frac{8\frac{1}{3}}{100} = \frac{1}{12}$;
   $8\frac{1}{3}$ % of a number = $\frac{1}{12}$ of the number.
   $8\frac{1}{3}$ % of 24 eggs = ——

What % of a number is:

	a	*b*	*c*	*d*	*e*
7.	$\frac{1}{4}$ of it?	$\frac{2}{4}$ of it?	$\frac{3}{4}$ of it?	$\frac{4}{4}$ of it?	$\frac{5}{4}$ of it?
8.	$\frac{1}{5}$ of it?	$\frac{2}{5}$ of it?	$\frac{3}{5}$ of it?	$\frac{4}{5}$ of it?	$\frac{6}{5}$ of it?
9.	$\frac{1}{8}$ of it?	$\frac{2}{8}$ of it?	$\frac{3}{8}$ of it?	$\frac{5}{8}$ of it?	$\frac{7}{8}$ of it?
10.	$\frac{1}{6}$ of it?	$\frac{2}{6}$ of it?	$\frac{3}{6}$ of it?	$\frac{4}{6}$ of it?	$\frac{5}{6}$ of it?
11.	$\frac{1}{12}$ of it?	$\frac{2}{12}$ of it?	$\frac{3}{12}$ of it?	$\frac{4}{12}$ of it?	$\frac{6}{12}$ of it?
12.	$\frac{1}{3}$ of it?	$\frac{2}{3}$ of it?	$\frac{3}{3}$ of it?	$1\frac{1}{3}$ of it?	$1\frac{2}{3}$ of it?

Oral Exercise

353. 1. What fraction of \$1 is 1¢? What % of \$1 is 1¢?

2. What fraction of \$1 are 3¢? What % of \$1 are 3¢?

3. What is 5% of 1 dollar? What is 1% of \$5?

4. What is 1% of 6 dollars? What is 6% of \$6?

5. What is 6% of 100 pounds? What is 6% of 500 pounds?

Written Exercise

354. Illustrative Example. Find 6% of \$100.

SOLUTION. 1% of \$100 = $\frac{1}{100}$ of \$100, or \$100 × .01, = \$1.00. 6% of \$100 = $\frac{6}{100}$ of \$100, or \$100 × .06 = \$6.00. Therefore, 6% of \$100 = \$6.00. *Ans.* \$6.

To find a given per cent of any number, multiply the number by the number of per cent, and in the product point off two places for hundredths.

1. Find 10% of 900 feet; of 1000 feet.

2. What is 9% of 850 tons? 8% of 450 hours?

3. What is 16% of 3000 minutes? 50% of 670?

4. What is 25% of 460? $12\frac{1}{2}$% of 135?

5. In a school of 524 pupils 52% were girls. How many were girls? How many were boys?

6. From 64 gallons of milk a milkman lost by an accident 30%. How many gallons did he lose?

7. From a lot of 360 chickens 23% were lost by exposure. How many chickens remained?

Oral Exercise

355. What is:

1. 1% of 100 gal.? 1% of 600 gal.? 6% of 600 gal.?

2. 1% of 100 yards? 1% of 1 yard? 2% of 1 yard?

3. 3% of 2 yd.? 16% of 1 oz.? 16% of 5 oz.? 16% of 100 oz.?

4. 10% of \$100? 10% of \$1? 10% of \$1000? 1% of \$1000?

What per cent of anything is:

5. $\frac{1}{5}$ of it? $\frac{1}{3}$? $\frac{1}{6}$? $\frac{1}{8}$? $\frac{1}{12}$? $\frac{1}{10}$? $\frac{2}{10}$? $\frac{2}{5}$? $\frac{5}{6}$?

To what fractions are the following per cents equal?

6. 25%? 50%? 30%? 40%? 5%? 75%?

7. $12\frac{1}{2}$%? $37\frac{1}{2}$%? $8\frac{1}{3}$%? $16\frac{2}{3}$%? $33\frac{1}{3}$%? $66\frac{2}{3}$%?

Supply the missing numbers in the following:

	a	*b*	*c*	*d*
8.	$\frac{3}{50}$ = ——— %	$\frac{8}{25}$ = ——— %	$\frac{9}{20}$ = ——— %	$\frac{1}{8}$ = ——— %
9.	$\frac{1}{3}$ = ——— %	$\frac{1}{6}$ = ——— %	$\frac{1}{5}$ = ——— %	$\frac{2}{3}$ = ——— %
10.	$\frac{3}{4}$ = ——— %	$\frac{2}{4}$ = ——— %	$\frac{2}{5}$ = ——— %	$\frac{3}{5}$ = ——— %
11.	$\frac{4}{5}$ = ——— %	$\frac{2}{6}$ = ——— %	$\frac{3}{6}$ = ——— %	$\frac{4}{6}$ = ——— %
12.	$\frac{5}{6}$ = ——— %	$\frac{2}{8}$ = ——— %	$\frac{3}{8}$ = ——— %	$\frac{4}{8}$ = ——— %
13.	$\frac{5}{8}$ = ——— %	$\frac{6}{8}$ = ——— %	$\frac{7}{8}$ = ——— %	$\frac{2}{10}$ = ——— %
14.	$\frac{7}{10}$ = ——— %	$\frac{8}{10}$ = ——— %	$\frac{9}{10}$ = ——— %	$\frac{1}{12}$ = ——— %
15.	$\frac{2}{12}$ = ——— %	$\frac{3}{12}$ = ——— %	$\frac{4}{12}$ = ——— %	$\frac{5}{12}$ = ——— %
16.	$\frac{10}{12}$ = ——— %	$\frac{11}{12}$ = ——— %	$\frac{1}{20}$ = ——— %	$\frac{2}{20}$ = ——— %
17.	$\frac{3}{20}$ = ——— %	$\frac{4}{20}$ = ——— %	$\frac{5}{20}$ = ——— %	$\frac{6}{20}$ = ——— %
18.	$\frac{7}{20}$ = ——— %	$\frac{8}{20}$ = ——— %	$\frac{9}{20}$ = ——— %	$\frac{10}{20}$ = ——— %

(Advertisement)

DISCOUNT SALE

LANE & HAYDEN, 144 FRONT STREET

NEW AND SECONDHAND WAGONS

A large stock of new and secondhand harnesses of all kinds; five single tipcarts and harnesses; three heavy truck wagons; sleighs of all kinds; wagon poles, new and secondhand, heavy and light; a large stock of summer blankets, saddlery, hardware, and stable equipments — at 25 % discount.

356. A reduction from the regular or usual price of goods is called a **discount.**

By the above advertisement Lane & Hayden are to sell their stock of goods at 25 % discount.

Written Exercise

357. 1. Mr. Hayden sells a $150 truck wagon at 25 % discount. How much does he get for the wagon?

2. What is the discount at 25 % on a $28 harness? What is the reduced price?

3. A $48 sleigh sells for 25 % below the regular price. What is the discount? How much does it sell for?

4. A $38 tipcart sells for 25 % below the regular price. What is the discount? How much does it sell for?

5. $220 worth of blankets were sold at 25 % discount. The lot sold for how much?

6. One lot of 24 lap robes worth $3 each sold at 25 % discount. How much did they sell for?

Written Exercise

358. Find the discounts and selling prices on the following:

	Regular Price	Discount		Regular Price	Discount
1. Automobile	$1200	25%	8. Show Case	$40	15%
2. Piano	300	40%	9. Billard Table	150	4%
3. Carriage	500	20%	10. Delivery Wagon	100	$8\frac{1}{3}$%
4. Sewing Machine	35	5%	11. Watch	55	$4\frac{1}{2}$%
5. Desk	60	$16\frac{2}{3}$%	12. Camera	35	2%
6. Real Estate	3000	$33\frac{1}{3}$%	13. Bookcase	85	10%
7. Typewriter	100	$12\frac{1}{2}$%	14. Cabinet	45	20%

15. A man paid $4000 for a piece of property and sold it at a discount of 20%. What was the loss (discount) and how much did he get for it?

16. Silk worth $1 a yard sells at 15% discount. What is the selling price of 14 yards?

17. I buy $500 worth of goods at 3% discount. What is the discount and how much do I pay for the goods?

Find the selling price of the following at given discounts from list price.

	List Price	Discount		List Price	Discount
18.	80¢ tea at	20%	22.	60¢ molasses at	$16\frac{2}{3}$%
19.	40¢ coffee at	5%	23.	$8 coal at	$6\frac{1}{4}$%
20.	$1.25 silk at	20%	24.	$1.50 gloves at	$33\frac{1}{3}$%
21.	$4.00 boots at	$12\frac{1}{2}$%	25.	$10 suit at	40%

359. In all towns and cities the people owning houses and lands, called real estate, or other property, pay into the treasury each year money to meet the public expenses.

360. Money paid in to meet the public expenses is called **taxes** or a **tax**.

Written Exercise

361. 1. In the town of G the tax rate is \$13 for each \$1000 worth of property that a person owns. Mr. Brown owns \$ 6000 worth of property. His tax is how many times \$13? What is his total tax?

2. After Mr. Hadley's death his property was valued as follows:

Block on Main St.	\$ 22,000	
Houses on Chestnut St.	5,000	
Furniture and wearing apparel	3,000	
Cash in Saving Banks	15,000	
Total		
Less debts		\$ 460
Less mortgage on Main St. block		\$ 6400
Balance		

Find the exact value of the above property when debts and mortgage are paid.

3. Find the tax on the above block on Main St. at \$ 14 on \$1000. What is the tax on the houses?

4. What is the tax of A. S. Kimball on a house and lot valued at \$3800, the tax rate being \$20 on \$1000?

Written Exercise

362. 1. Cannon were first used in war in 1346. That was how many years ago?

2. Spinning wheels were first used 370 years before the year 1900. Find the date when they were first used.

3. In 1844 the first telegraph line in America was run from Baltimore to Washington. That was how many years ago?

4. Gunpowder was invented by Schwartz in 1328. That was how many years before the use of cannon in war in 1346?

5. Roger Bacon gave a recipe for making gunpowder in 1270. How many years was that before the invention by Schwartz?

6. Cyrus Hall McCormick invented the horse reaper for harvesting grain in 1831. This was how many years earlier than the invention of the sewing machine by Elias Howe in 1845?

7. From 1850 to 1860, 21,600 miles of railroad were built in the United States. What was the average number of miles built per year?

8. Washington was elected president in 1789. How many years have elapsed since that time?

9. Between Memorial Day (May 30) and Independence Day (July 4) there are how many months and days?

10. Jamestown, Virginia, was settled in 1607. That was how many years before the Declaration of Independence, which was made in 1776?

Oral Exercise

363. 1. Mr. Dana hires a horse and carriage of the livery man at the rate of $2 per hour. How much does he pay for 5 hours' use of the horse and carriage?

2. Mrs. B rents a piano for her summer house at the rate of $10 per month. How much does she pay for its use for 3 months?

3. Mr. C lets a house to Mr. M at the rate of $25 per month. At that rate how much does Mr. M pay for one year's rent?

4. Mr. Vance loans $100 to Mr. Gardner for 1 year. Mr. Gardner agrees to pay Mr. Vance $6 for the use of the $100 for 1 year. At the same rate how much would Mr. Gardner pay for the use of $600 for a year?

5. At the same rate as in example 4 ($6 for $100 for 1 year), how much would be paid for the use of $100 for $\frac{1}{2}$ year? for 6 months? for 3 months? for 1 month?

6. At the same rate as in example 4 ($6 for $100 for 1 year), how much would be paid for the use of $200 for 1 year? for $\frac{1}{2}$ year? for 3 months? for 1 month?

364. Money paid for the use of money is called **interest.**

7. What would be the interest on $400 for 1 year at the rate of $5 for the use of $100 for 1 year?

At the same rate as in example 7, tell what the interest would be on the following:

	a	*b*	*c*
8.	$300 for 2 yr.	$400 for 6 mo.	$100 for 3 yr.
9.	$600 for 1 yr.	$200 for 3 mo.	$300 for 1 yr.

Oral Exercise

365. 1. At the rate of \$ 7 a year for \$ 100, how much interest does a man pay for \$ 300 for 1 year? How much does he pay at the same rate for \$ 300 for 2 years?

366. The sum of money for which interest is paid is called the **principal.**

367. The fractional part of the principal to be paid for the use of money is called the **rate of interest.**

368. Interest at 6% means at the rate of $\frac{6}{100}$ of the principal for 1 year. The **time** is understood to be 1 year if not otherwise stated.

This rate gives \$ 6 for the use of \$ 100, or 6 cents for the use of 100 cents for 1 year.

2. What is the interest on \$ 200 for 1 year at 5%? for 2 years at 3%? for 3 years at 2%? for 1 year at 10%?

3. What is the interest on \$ 200 for 3 years at 6%? for 2 years? for 5 years?

4. What is the interest on \$ 1 for 1 year at 6%? for 2 years? for 10 years? for 5 years?

5. Mr. Howard loans to Mr. Barrows \$ 600 for 1 year at 4%. How much does the interest amount to for the entire time? If Mr. Barrows pays the interest at the end of 6 months, how much does he pay at that time? At the close of the year how much does he owe?

6. A merchant pays interest on \$ 400 worth of goods for 6 months at the rate of 8%. What is the amount of the bill plus the interest due at the end of 6 months?

Written Exercise

369. Illustrative Example. Find the interest on $650 at 6 % from Oct. 16, 1902, to April 16, 1904.

WORK

1904 --- 4 --- 16
1902 --- 10 --- 16
1 --- 6 --- 0

Interest for 1 yr. .06 of $650.
Interest for 6 mo. .03 of $650.
$650 .09
.09
$58.50 interest.

EXPLANATION. Calling October the 10th month and April the 4th, we find the time in years and months between Oct. 16, 1902, and April 16, 1904, to be 1 year and 6 months. The interest for 1 year at 6 % is .06 of the principal; for 6 months ($\frac{1}{2}$ yr.) it is .03 of the principal; for 1 yr. and 6 mo. the interest at 6 % is .09 of the principal; for 1 yr. and 6 mo. the interest on $650 is .09 of $650 = $58.50. *Ans.* $58.50.

Find the interest on:

1. $100 at 6 % from Dec. 1, 1905, to Dec. 1, 1906.
2. $220 at 4 % from Jan. 5, 1906, to Jan. 5, 1907.
3. $340 at 5 % from Oct. 10, 1900, to Oct. 10, 1902.
4. $160 at 6 % from Jan. 1, 1907, to June 1, 1907.
5. $100 at 6 % from Jan. 1, 1907, to June 1, 1908.
6. $270 at 6 % from June 10, 1906, to Jan. 10, 1908.
7. $500 at 6 % from Feb. 11, 1904, to Aug. 11, 1905.
8. A loan of $450 for 6 years at 5 % gains how much interest?